

Cool School Challenge



Car Economics Activity

TEACHER GUIDE

By simulating the process of purchasing a vehicle, students will learn how to compare and contrast variables, such as car prices, fuel economy, gas prices, and CO₂ emissions. Students will see how different vehicles affect the amount of carbon dioxide released into the atmosphere. Assuming, for this exercise, that a car lasts ten years, students will calculate the long-term costs and efficiency of their vehicle choice.

Objectives:

Students will be able to:

- Determine the costs, fuel efficiency and CO₂ output for a long-term period of a vehicle.
- Understand the range of impact by analyzing least and most efficient vehicles.
- Understand the variables that contribute to these differences and which choices have the least environmental impact.

Class Time:

- 10 minutes class preparation.
- 45 minutes to an hour as homework project (some of this can also be done in the classroom).
- 20 minutes post discussion in class.

Materials:

- Car Economics Introduction
- New Fuel Economy Label
- Car Economics Student Worksheet

Grade level: 7-12

Subjects:

Science; Economics; Math; World / Global Studies; Social Sciences.

Concepts:

Fuel economy, fuel efficiency

Washington State EALRs:

Science: 1.3, 2.1, 3.2

Economics: 2.3, 3.1

Math: 1.1, 1.5, 3.1, 3.3, 5.2, 5.3

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Teacher Directions:

1. Lead a discussion using the [Car Economics Introduction](#) or have students read it themselves.
2. Give each student a copy of the [Fuel Economy Label](#). Familiarize them with all the information on the label.
3. Provide students with the worksheet and set as homework, outlining the three areas for homework:
 1. Have students do one of the following:
 - Make a trip to a local car dealership and gather information on the least and the most efficient vehicles available. Fill in the information on your worksheets. Remind students to pick up a business card to prove they went!
 - OR*
 - Pick two vehicles for purchase from the classified ads in the paper or online and go to www.fueleconomy.gov to figure out the vehicles' fuel economy.
 2. At the local gas station, note down the price of one gallon of unleaded gas on the worksheets.
 3. Answer the remaining questions on the worksheet, using the information you have gathered.
4. Once all students have completed the homework assignment, review their discoveries in a class discussion. You may wish to use the following questions to guide your discussion. As an alternative, you could have students complete a writing assignment addressing one or more of the following questions.
 1. Should cars that pollute more cost more? Why or why not?
 2. Why do you think SUVs are so popular with drivers today, given their low mileage and significant greenhouse gas emissions?
 3. What do you think would motivate drivers to buy cleaner, less-polluting vehicles instead?
 4. Should there be incentives for people to drive hybrids, such as being allowed in the HOV (high occupancy vehicles) lanes?
 5. Should government organizations enforce stricter fuel economy standards, so that the gas-guzzlers are no longer manufactured? Explain.

Glossary:

Fuel economy - A measure of the amount of fuel needed to move a motor vehicle a given distance, generally stated in "miles per gallon" (mpg).

Fuel efficiency - refers to how efficiently a vehicle converts fuel to energy. The more fuel efficient a vehicle is, the further it can travel on a gallon of gas.

Resources:

FuelEconomy.gov: This United States Department of Energy website provides information on the fuel economy as well as online calculators to determine the fuel efficiency of vehicles. www.Fueleconomy.gov

U.S. Environmental Protection Agency - Fuel economy sample label: www.epa.gov/fueleconomy/label.htm

U.S. EPA Green Vehicle Guide: Find fuel-efficient vehicles and compare their Air Pollution and Greenhouse Gas scores. www.epa.gov/greenvehicles/

Puget Sound Clean Air Agency: Clean Cars Initiative - to research government standards:
www.pscleanair.org/programs/climate/cleancars/default.aspx



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Car Economics Activity

INTRODUCTION

Have you, or someone you know, bought a car recently?

What factors were taken into consideration in choosing the car? Make and model, safety, reliability, -- how 'cool' it looks? For many people, the cost of the vehicle often comes into play, and increasingly, people are also thinking about fuel economy. Fuel economy measures how far a car can travel on a gallon of gas - usually expressed as "miles per gallon." The more miles per gallon a car can travel, the more *efficient* it is - which has both economic and environmental benefits. Going further on less fuel saves money. **And** - a vehicle with high fuel economy does more to help protect the planet. Every gallon of gasoline burned releases roughly 20 pounds of carbon dioxide into the atmosphere. So, the less gasoline a vehicle needs to travel a certain distance, the less carbon dioxide it will release during that journey.



Different makes and models of cars vary significantly in the miles they get per gallon - and the dollar amounts on their price tags! Does considering fuel economy in buying a car make sense (and cents)?

In this activity, you'll try to answer that question by going through the process of picking out a new vehicle and comparing its cost, fuel economy, and environmental impact. You'll either go to a local car dealership and find the least and most efficient vehicles for sale, or, compare two vehicles for sale in the classified ads.

Before you begin:

1. Familiarize yourself with the Fuel Economy Label used by the Environmental Protection Agency (EPA) to rate the fuel economy of new cars for both in-city and highway driving. These ratings are given in miles per gallon (mpg) and are posted on the windows of each car. Take a look at the sample label provided and make sure you understand how to interpret the information it contains.
2. Find out the current price for one gallon of unleaded fuel and record this in Table 1 of the Student Worksheet.

Name: _____

Class: _____

Date: _____

Car Economics Activity

Student Worksheet

Instructions

1. Go to a car dealership and find the least and the most fuel efficient vehicles available.
 - o *If you cannot get to a dealership, look through the classified ads in the paper or online and pick out two vehicles of different make & model for sale. Then go to www.fueleconomy.gov and figure out the mileage for those vehicles and continue with Step 2.*
2. Fill in the information about the vehicles in Rows 1-3 in Table 1.
3. Pick up a business card as proof you went (or bring clips of your newspaper or online ads).
4. Complete the calculations in Rows 4-5 to estimate the how much fuel each vehicle would use each year, and the related CO₂ emissions. Assume the vehicles would travel 15,000 miles per year, in combined driving conditions.
5. In Row 6, enter the current price for a gallon of unleaded gas.
6. Determine how much it would cost to fuel each vehicle for one year.
7. Assume the vehicle would be owned for ten years and driven in the same conditions for 15,000 miles each year. Calculate the 10-year cost of the vehicle (fuel costs for ten years x the original purchase price).



Car Economics Activity, continued...

TABLE 1: MOST & LEAST FUEL EFFICIENT VEHICLES

| | | Least fuel efficient vehicle | Most fuel efficient vehicle |
|----|--|---------------------------------|--------------------------------|
| 1. | Year, make and model | | |
| 2. | Purchase price | | |
| 3. | Miles per gallon: city | | |
| | highway | | |
| | combined | | |
| 4. | Gallons used per year (based on 15,000 miles per year, combined driving) | | |
| 5. | Pounds of CO ₂ produced per year (One gallon of gas burned produces 20 pounds of CO ₂ .) | | |
| 6. | Price of unleaded gas (per gallon) | \$ _____/GALLON | |
| 7. | Amount spent on gas for one year (in \$) (price x gallons/year based on 15,000 miles per year) | | |
| 8. | 10-year cost of the vehicle | | |

Car Economics Activity, continued...

Questions:

1. How many pounds of CO₂ would you save over ten years by buying the more efficient vehicle?
2. How many years would it take for a person to “break even” and start saving by buying the more efficient vehicle over the least efficient vehicle? (*Hint: you might create for yourself a year-by-year chart so you can see the pattern.*)
3. In Table 2 below, list the types of cars your family owns. Look up their fuel economy at www.fueleconomy.gov and then calculate the annual CO₂ emissions for each vehicle.

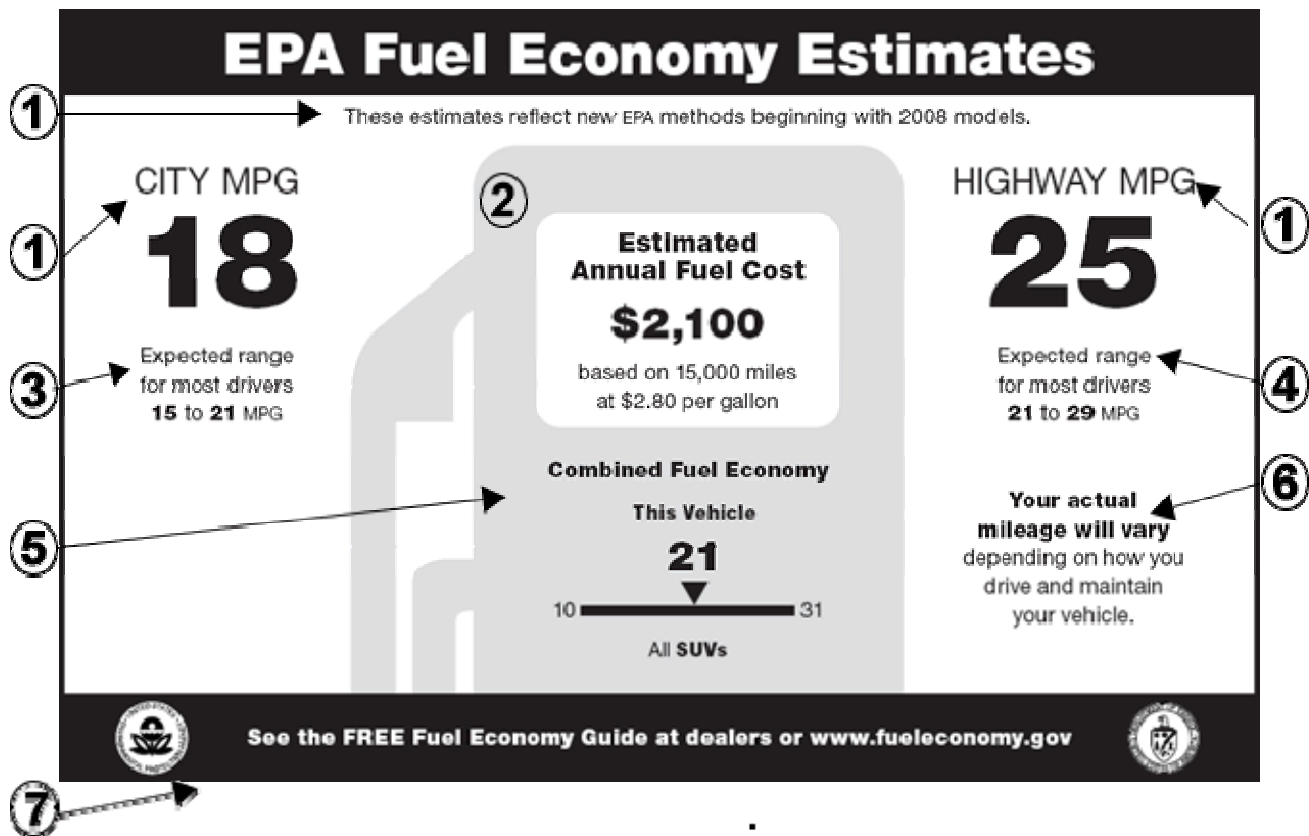
TABLE 2: HOUSEHOLD VEHICLE FUEL ECONOMY & CO₂ EMISSIONS

| Car Make and Model | City mpg | Annual CO ₂ emissions (based on 15,000 miles / year) |
|--------------------|----------|--|
| | | |
| | | |
| | | |

4. The average U.S. passenger vehicle got 19.5 miles per gallon¹. How many of your family’s vehicles are better than average?
5. Having compared several vehicles through this activity, what are the main factors that would influence your choice of vehicle?

¹Source: U.S. Department of Transportation, Bureau of Transportation Statistics. *National Transportation Statistics*
http://www.bts.gov/publications/national_transportation_statistics/html/table_04_23.html Values reflect the average for cars and light trucks combined for 2005.

Fuel Economy Label



Source: U.S. Environmental Protection Agency, <http://www.epa.gov/fueleconomy/label.htm>

- 1. New Methods:** The label shows the estimated city MPG at the top left, and highway MPG at the top right. The estimates on 2008 and later models are determined using new, more realistic methods. During the transition year, comparison shoppers should compare models that are built in the same model year, so compare 2007 models to 2007 models, etc.
- 2. Estimated Annual Fuel Costs:** The center of the label provides estimated annual fuel costs based on a given number of miles and fuel price, also listed on the label. Use this information to estimate fuel costs for this vehicle, and to compare fuel costs across different models.
- 3. Expected City Range:** Estimated city MPG range appears at the top left, under the main city MPG estimated number. Most drivers can expect to achieve city fuel economy within this range.
- 4. Expected Highway Range:** Estimated highway MPG range appears at the top right, under the main highway MPG estimated number. Most drivers can expect to achieve highway fuel economy within this range.
- 5. Compare to Other Vehicles:** The lower center of the label gives a combined city/highway estimate for that vehicle, and shows where that value falls on a bar scale that gives the highest and lowest fuel economy of all other vehicles in its class (e.g. SUVs, minivans, compact cars, etc). Use this information to compare the fuel economy of this vehicle to all others within its class.
- 6. Your actual mileage will vary:** The label includes a reminder that there are many reasons why your actual fuel economy may vary from the estimates. [See www.fueleconomy.gov](http://www.fueleconomy.gov) for fuel-saving tips.
- 7. For more information:** The label provides a Web address where you can find out more information [at www.fueleconomy.gov](http://www.fueleconomy.gov).