

What's in a Label?

Exploring Fuel Economy and the Environment

- **Grade Level**
5-8
- **Subject Areas**
Language Arts
Mathematics
Social Studies
Science
- **Duration**
30 min if given as homework
45-60 min if classwork
- **Setting**
Classroom
- **Skills**
Information gathering
Analyzing data
Presentation of data
- **Vocabulary**
Fuel economy
Greenhouse gas rating
Miles per gallon
Vehicle label
- **Related Websites**
www.fueleconomy.gov
www.epa.gov/otaq/carlabel

Summary

Students will learn how to read and understand fuel economy and environment labels.

Objectives:

Students will:

- Understand fuel economy
- Compare and contrast fuel economy and environment labels for various vehicles

Materials:

- Student Worksheet
- Internet access or printed Vehicle Information sheets

National Science Content

Standards:

- Science and Technology
Understanding about science and technology
- Science in Personal and Social Perspectives
Populations, resources, and environments
Risks and benefits
Science and technology in society

Background:

The Energy Policy Act of 1992 requires the U.S. Environmental Protection Agency and the U.S. Department of Energy to provide consumers with accurate miles per gallon (MPG) information. In May 2011, the U.S. EPA and the National Highway Traffic Safety Administration announced a new design for fuel economy labels, where consumers will be able to see the vehicle's fuel economy (miles per gallon), energy use, fuel costs, and environmental impacts. These labels will be available on all 2013 models.

Procedure:

Warm-Up:

Have students brainstorm about their favorite car or a car they'd like to have in the future. What features are most important? Are they more interested in stereos and sunroofs and color or miles per gallon and environmental impact? Have students make a list of what he/she requires in a dream car. Have a few students share what is important to him or her with the class.

Activity:

1. Review what is important for students in a dream car. How many listed fuel economy or miles per gallon? How many listed fuel emissions or environmental impact?
2. Introduce the concept of fuel economy. Fuel economy is the number of miles per gallon a car gets. A more efficient car gets more miles per gallon (i.e.: 50 mpg) than a less efficient car (i.e.: 30).
3. Show students examples of what the new fuel economy and environment labels look like. Access sample labels at <http://www.epa.gov/otaq/carlabel/basicinformation.htm>.
4. Discuss the various components of the label, including fuel economy, annual fuel cost, fuel economy and greenhouse gas rating, and fuel costs savings over 5 years.

Fuel economy— An estimate of miles per gallon, usually refers to combined city/highway

Fuel consumption rate— gallons per 100 miles. This relates directly to the amount of fuel used.



Figure 1: A sample gasoline fuel economy and environment label. Source: <http://www.epa.gov/otaq/carlabel/>

Annual fuel cost—The estimated fuel cost for a year, based on the assumptions in the fine print: cost is based on 15,000 miles per year at \$3.70 per gallon.

Fuel economy and greenhouse gas rating— A rating based on a scale of 1 to 10 with 10 being the best. This is based on how much carbon dioxide the car emits from the tailpipe. When cars burn fuel, they release carbon dioxide, a greenhouse gas. This means that the fuel economy of a car affects the amount of greenhouse gases the car emits.

Smog Rating— The rating from 1 to 10 with 10 being the best based on vehicle tailpipe emissions that cause smog and local air pollution, including nitrogen oxide, carbon monoxide, particulate matter, non-methane organic gas, and formaldehyde.

Fuel cost savings or spending—Shows the difference in fuel cost over a 5 year period between the chosen vehicle compared to the average new vehicle. When calculated, a positive number indicates that the consumer saves money compared to a new average vehicle, while a negative number would indicate that a consumer spends that much more on fuel compared to the new average vehicle. The new average vehicle is estimated to get 22 MPG, driving 15,000 miles per year at a cost of \$3.70 per gallon, coming to \$12,600 over a five year period. The label on a new car would state “you save X” or “you

spend X more” in fuel costs. For the purpose of this activity, have students indicate saving with a positive number and spending with a negative number.

- Use FuelEconomy.gov’s Find A Car tool to look up fuel economy and environmental emissions. (To access, visit www.fueleconomy.gov. Click “Find a Car” on the upper left side of the page). You may wish to demonstrate this during class.
- Using the tool’s information, instruct students that they will fill in his/her blank fuel economy and environment label. You can either provide students with various car makes and models or allow students to research a car of his/her choice. Encourage students to explore different fuel types. (Note: You may assign this portion as homework).
- After students have completed his/her fuel economy and environmental emissions, compare and contrast the various vehicles by having each student or group summarize the car they researched. Which are more efficient, SUVs or compact cars? What cars have higher greenhouse gas ratings? How are fuel economy and greenhouse gas rating related to each other? What type of fuel provide a lower annual fuel cost? How are annual fuel costs and economy related?

Wrap Up:

- Review fuel economy and environment labels. How will these labels help consumers? Are there any drawbacks to the labels?
- Ask students if his/her criteria for choosing a car has changed. Will they take fuel economy and environmental impact into consideration when choosing a car in the future?

Assessment:

Ensure that students have completed his/her fuel economy and environment label and answered the discussion questions on the student worksheet. See the sample student page as an example of acceptable answers. Note that numbers will vary based on the

vehicle chosen.

Extensions:

1. Have each student research 3 different vehicles (i.e.: SUV, hybrid, and compact car) and create a pro/con chart to choose a vehicle. Look for student rationale as to why a particular car is chosen over the others.
2. There is a plan in government to tighten the minimum miles per gallon standards to reach 40 MPG on average by 2025. Have students debate the increase in fuel mileage and reduction in greenhouse gas emissions that may result. Students may also research and debate the advantages and disadvantages of electric and gasoline powered vehicles in relation to MPG and greenhouse gas rating.

Resources and Related Links:

U.S. Department of Energy and U.S. Environmental Protection Agency. Fuel Economy Information
<http://www.fueleconomy.gov>

U.S. Department of Energy and U.S. Environmental Protection Agency. Find a Car Tool
<http://www.fueleconomy.gov/#findacar>

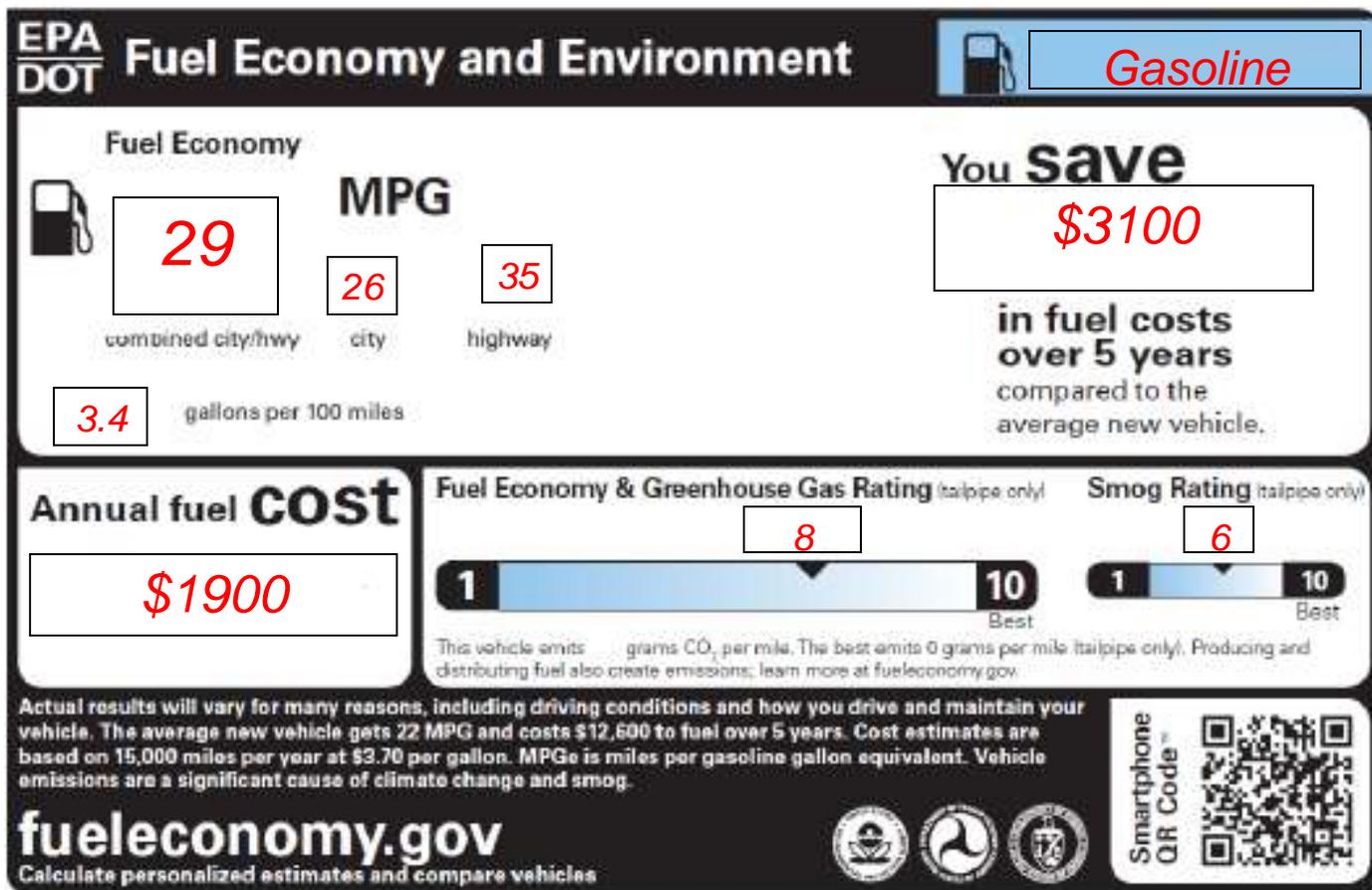
U.S. Environmental Protection Agency. Fuel Economy and Environment Labels
<http://www.epa.gov/otaq/carlabel>

What's in a Label? Worksheet

Name: _____

Instructions:

1. Research your vehicle using www.fueleconomy.gov and the "Find a Car" tool. Fill in the label below. Be sure to include:
 - Fuel economy, including combined city/hwy, city, and highway mpg.
 - Gallons per 100 miles.
 - Fuel savings over 5 years.
 - The type of fuel used.
 - Annual fuel cost.
 - Fuel economy and greenhouse gas rating.
 - Smog rating.
2. Round your answers for fuel costs to the nearest \$50. The EPA/DOT labels round their information to the closest \$50.
3. Answer the discussion questions on the next page.



Helpful Hints:

1. To find gallons per 100 miles, click "Gallons/100 miles" under the heading "Switch Units" on FuelEconomy.gov's Find a Car tool.
2. To calculate the savings over 5 years, multiply the annual fuel cost by 5. Subtract from the 5 year cost of an average new vehicle, which is \$12,600. Note that a negative number implies that you are spending more instead of saving.

Questions:

1. What vehicle did you choose? Be sure to include the make, model, and year. Why did you choose this vehicle?

This example is a 2006 Toyota Corolla. Answers will vary as to why students chose the vehicle.

2. What type of fuel does your vehicle use?

This vehicle uses Gasoline.

3. What was your vehicle's greenhouse gas rating? What does this rating mean?

The greenhouse gas rating was 8. This means that this vehicle emits less greenhouse gas emissions than other vehicles. The best vehicles have a rating of 10 on the scale.

4. How might fuel economy affect the greenhouse gas rating?

A vehicle that is designed to have a higher fuel economy will have a better greenhouse gas rating. Higher fuel economy means less fuel is burned to go the same distance, which means lower emissions of greenhouse gases. Additionally, how one drives and maintains the vehicle can increase or decrease fuel economy. If one drives efficiently to maximize fuel economy, less greenhouse gases are emitted per mile. Maximizing fuel economy can reduce greenhouse gas emissions, thus increasing the greenhouse gas rating.

5. Does your vehicle cost more or less money in fuel than the average new vehicle? Why do you think it costs more/less?

This vehicle costs less in money for fuel than the average new vehicle. The average new vehicle gets 22 MPG while this vehicle gets 29 MPG. The increase in MPG causes less gas usage and therefore, a decrease in fuel costs. Choosing a vehicle with a different fuel type also affects annual fuel costs.

6. Would you recommend this vehicle to someone who was interested in a fuel efficient and environmental friendly vehicle?

Answers will vary. Look for logical reasoning for why the student recommends or does not recommend the vehicle based on the data.

7. What are ways you or your family can reduce greenhouse gas emissions from your car?

Answers may include, but are not limited to: Drive efficiently, carpool, use public transportation, invest in a car with a higher greenhouse gas rating, drive less and drive smart, keep car maintained, etc.

Name: _____

Instructions:

1. Research your vehicle using www.fueleconomy.gov and the "Find a Car" tool. Fill in the label below. Be sure to include:
 - Fuel economy, including combined city/hwy, city, and highway mpg.
 - Gallons per 100 miles.
 - Fuel savings over 5 years.
 - The type of fuel used.
 - Annual fuel cost.
 - Fuel economy and greenhouse gas rating.
 - Smog rating.
2. Answer the questions on the next page.

EPA DOT Fuel Economy and Environment

Fuel Economy

MPG

combined city/hwy city highway

gallons per 100 miles

You save

in fuel costs over 5 years compared to the average new vehicle.

Annual fuel COST

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 1 10 Best

Smog Rating (tailpipe only) 1 10 Best

This vehicle emits grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 22 MPG and costs \$12,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

Helpful Hints:

1. To find gallons per 100 miles, click "Gallons/100 miles" under the heading "Switch Units" on FuelEconomy.gov's Find a Car tool.
2. To calculate the savings over 5 years, multiply the annual fuel cost by 5. Subtract from the 5 year cost of an average new vehicle, which is \$12,600. Note that a negative number implies that you are spending more instead of saving.

Questions:

1. What vehicle did you choose? Be sure to include the make, model, and year. Why did you choose this vehicle?
2. What type of fuel does your vehicle use?
3. What was your vehicle's greenhouse gas rating? What does this rating mean?
4. How might fuel economy affect the greenhouse gas rating?
5. Does your vehicle cost more or less money in fuel than the average new vehicle? Why do you think it costs more/less?
6. Would you recommend this vehicle to someone who was interested in an a fuel efficient and environmental friendly vehicle?
7. What are ways you or your family can reduce greenhouse gas emissions from your car?