**Transportation**

Last Updated: September 19, 2013

**Background**

There are many, many forms of transportation. Some methods of transportation include by plane, train, automobile, boat, submarine, motorcycle, bicycle, and foot. All of these have some effect on the environment.

Worldwide, our transportation choices are causing dangerous levels of air pollution. Gasoline powered vehicles burn most of the world’s petroleum, introducing pollution such as nitrous oxides and particulates to the surrounding atmosphere to form smog, decrease visibility, and harm human health. Transportation also accounts for more than 12% of greenhouse gas emissions worldwide, and is one of the fastest growing emission sectors. Many countries have emissions regulations controlling transportation pollution for the purposes of improving ambient air quality and human health. While individual emissions have decreased, this has been offset by the increase in number of vehicles and their usage time.

Other environmental impacts of transport systems include traffic congestion, automobile-oriented urban sprawl, and noise and light pollution.

**Objectives**

Students will be able to:

* Understand that gasoline combustion moves the vehicle as well as emit greenhouse gases.
* Identify a combustion chamber, piston, and exhaust valve in a conventional internal combustion engine vehicle.
* Understand that carbon emissions from vehicles are very large due to the scale of driving that occurs annually.
* Understand that alternative fuel vehicles have lower tailpipe emissions but overall emissions are not necessarily lower.
* Understand that alternative fuel vehicles can emit less carbon than conventional internal combustion engine vehicles but face challenges such as increased cost and lack of fueling infrastructure.
* Understand that buses emit more carbon than individual cars but have a larger passenger capacity.

**Materials Needed**

* “Transportation presentation.pptx”

**Safety Concerns**

None.

**Vocabulary**

* Energy (general): Energy that the plants and animals originally obtained from the sun is stored in the form of carbon in natural gas.
* Internal combustion engine: The internal combustion engine is an engine in which the combustion of a fuel (normally a fossil fuel) occurs with an oxidizer (usually air) in a combustion chamber that is an integral part of the working fluid flow circuit. The expansion of the high-temperature and high-pressure gases produced by combustion apply direct force to some component of the engine. The force is applied typically to pistons, turbine blades, or a nozzle. This force moves the component over a distance, transforming chemical energy into useful mechanical energy.

**Procedure**

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| --- | --- | --- | --- |
| **Time** | **Activity** | **Description** | **Supplies** |
| 15 | Slides | Explain how traditional internal combustion engine vehicles operate. | “Transportation presentation.pptx” |
| 15 | Slides | Explain how much people drive every year and the magnitude of transportation emissions. | “Transportation presentation.pptx” |
| 15 | Slides | Cars of the future: alternative fuel vehicles including electric vehicles and hydrogen fuel cell cars. Explain goals of saving fuels and reducing emissions. | “Transportation presentation.pptx” |
| 15 | Slides | Alternative transportation modes, how can buses be better than cars? | “Transportation presentation.pptx” |

**Additional Resources**

**Reputable**

US Department of Transportation <http://www.dot.gov/>

Alternative Fuel Vehicles | US Department of Energy <http://www.fueleconomy.gov/feg/current.shtml>

Electric Vehicles | US Department of Energy <http://www.fueleconomy.gov/feg/evsbs.shtml>

Hybrids | US Department of Energy <http://www.fueleconomy.gov/feg/hybrids.jsp>

Clean Vehicles | Union of Concerned Scientists <http://www.ucsusa.org/clean_vehicles/why-clean-cars/global-warming/>

Transportation and Air Quality | US Environmental Protection Agency <http://www.epa.gov/otaq/>

**Opinion / Newspaper**

To be added

How an engine works

<http://www.youtube.com/watch?v=-8cXXjsRg70>

Cost of commuting

<http://myfamilysmoney.com/blog/commuting-cost-analysis-bus-vs-bike-vs-car/>

<http://commutesolutions.org/external/calc.html>

Alternative fuel cars

<http://www.energyquest.ca.gov/transportation/index.html>

How Catalytic Converters Work | How Stuff Works <http://auto.howstuffworks.com/catalytic-converter1.htm>

**Author(s)**

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**Next Generation Science Standards Alignment**

HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Crosscutting Concept: Stability and Change

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Crosscutting Concept: Stability and Change

HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Crosscutting Concept: Influence of Science, Engineering, and Technology on Society and the Natural World