

Average Vehicle Occupancy (AVO) In Your Community

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National Academic Standards:

Science

Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Science in Personal and Social Perspectives

- Natural Resources
- Environmental Quality

Social Studies

Production, Distribution, and Consumption

- Compare how values and beliefs influence decisions in different societies

Physical Education and Health

Reducing Health Risks

- Demonstrate the ability to practice health-enhancing behaviors and reduce health risks

Grades: 6-10

Subjects: Science, Social Studies, Health

Objectives:

- Determine the Average Vehicle Occupancy in your community.
- Develop, administer, and analyze a survey to determine attitudes toward air pollution and transportation.

Materials:

City street map, pencil, paper

Background:

Many states in the U.S., and many countries around the world, have serious air quality problems. And, while the pollution may start in a particular geographic area, winds carry these clouds of pollution to other regions. As cities grow in size, air pollution problems often grow as well.

Many laws have been passed to force polluters to clean up their business, most notably the Clean Air Act in the U.S. Industries such as paper mills, steel foundries, and chemical plants must adhere to strict emission guidelines and undergo regularly scheduled smokestack tests to make sure that unhealthy levels of pollution are not blown into the air. These laws have helped significantly in improving our air.

One of the biggest sources of pollution is gas-powered vehicles - notably cars, trucks, buses, motorcycles, and other engines that need gasoline in order to run. As the population has increased, so, too, has the

number of vehicles. Travel data from the 1997 U.S. Census has shown a 39 percent increase since 1980 in the number of miles driven in our vehicles. In other words, for every 100 miles traveled by cars in 1980, cars in 1997 traveled 139 miles. In the same census, people carpoled for only 9 percent of their trips, took transit only four percent of the time, and biked or walked for only 6.5 percent of the trips.

While it is true that cars are "cleaner" than in the past, the rapid rise in the number of vehicles on the highways still creates pollution. One way to get everyone where they're going with fewer vehicles is to use alternative means of travel such as buses, trains, bicycles, and carpools. The more people a single gas-powered engine can transport, the better it is for the environment. Not only does this reduce air pollution, it helps make our highways last longer, saves gasoline and oil, reduces stress associated with traveling in heavy traffic, and slows down the need to build bigger and longer superhighways.

The number of people traveling divided by the number of vehicles gives us an "Average Vehicle Occupancy" or AVO. For example, according to the Federal Highway Administration, as of 1997 the United States had an AVO of 1.59. This is the same as saying that 159 people are getting to their destinations by using 100 vehicles:

$$\frac{159 \text{ people}}{100 \text{ vehicles}} = 1.59 \text{ AVO}$$

The Clean Air Act Amendment of 1990 requires the counties in the most polluted regions of each U.S. State to monitor specific air pollutants and to take action to reduce air pollution. One way to reduce air pollution and traffic congestion is by promoting alternative ways of traveling. Employers can play a big role by encouraging their employees to carpool, use the bus, walk, or bike to work, and offering special benefits for those employees who participate.

For more information, visit [The Library](#) on the Easy Breathers Web site.



Procedure:

- Using a street map of your community highlight the "commuter roadways." These are the major roadways that people use to travel to or from work. From this map determine the best locations to conduct a survey of traffic and the number of people traveling in each vehicle. Before conducting the survey, inspect each observation point and carefully select a safe place to stand.
- Students should predict what they think the average vehicle occupancy will be. Then, using a tally sheet, have students determine the number of vehicles and the number of people in each vehicle. Counters should make very specific comments to the recorder. Example: "car-one person," "truck-two people." Students should keep a separate count of any walkers or bikers. Have students survey for 10 minutes. If possible, have them conduct the survey during the hours of 6 A.M. and 10 A.M. when most people are traveling to work. Compare the different sites in your community. Calculate the AVO for your community.
- Have students develop a written or oral survey to determine commuters' attitudes toward trip reduction. The survey should target why people decide to carpool or take transit. The survey should also focus on reasons drivers have for driving alone.

After analyzing the survey responses, have your students come up with ideas that promote carpooling, bicycling, bus riding, and walking.

Extension:

- Students can survey vehicles entering the school parking lot to determine AVO of the students and teachers. A school survey could be completed that determines the number of miles that students and teachers drive to school and back each day. Based on the results, the students could develop a trip reduction program for their school.
- Students can survey businesses in the area to learn more about their efforts to encourage carpooling, use of mass transit and biking.

Submit your AVO results to the Easy Breathers project via our Web site:
www.easybreathers.org