

Additional Activities

Good

Moderate

Unhealthy for Sensitive Groups

Unhealthy

Very Unhealthy

Additional Activities

Introduction

Teachers can use these additional activities as supplements to the lesson plans in this toolkit, or as brief introductions to air quality issues if time is limited. Prior to conducting these activities, teachers may want to review the fact sheets, handouts, and *Background Summary* sections in applicable lesson plans for relevant information to share with students.

Grades K-2

Why Is Coco Orange?

- Read "Why is Coco Orange?" to your students. This picture book introduces the AQI colors to children in grades K-2, teaches them what the different colors mean, how to recognize health symptoms and what actions to take when air quality is bad (www.airnow.gov/picturebook).
- Check your local AQI forecast at www.airnow.gov. Make copies of the "coloring page" and have your students color the chameleons to match today's AQI color. (www.airnow.gov/picturebook).
- Have your students complete the activity sheets at www.airnow.gov/schoolflag.

Match Game

- Access the "clean air/dirty air" matching cards from "Connecting Activity #2 – Clean Up on Gloomy-Doomy" (see the last two pages) at:
www.intheair.org/modules/K-3-ConnectingActivity2.pdf
- Make copies of the matched sets and cut the cards apart, providing enough cards so that each student will have one card of a pair. Place the cards in a bag or box, half of them "dirty" and half "clean" air cards. Have students pick one card out of the box or bag. Ask students whether they think they have a card with a picture of what makes the air dirty or what keeps it clean. Have those with the "dirty air" cards move to one side of the room, and those with "clean air" cards move to the other side of the room. Check the accuracy of students' choices.
- Explain that the purpose of the game is to match clean air cards with dirty air cards to show how dirty air can be made cleaner. Have students look at their cards to decide what kind of match they will be looking for. Then have the two groups mingle and make the matches. When two students believe they have a match, they come to the teacher to see if they are correct. If so, they sit down together; if not, they go back into the group and try again.
- When all the matches have been made correctly, each pair describes to the class what is on their and their partners' cards and how the two pictures connect in keeping the air clean. The teacher helps students with the answers as needed, for example: a fly swatter and a can of insect spray are a match because a fly swatter can kill a fly without putting something harmful in the air that will make it dirty, or polluted, like insect spray will; a bicycle and a car are a match because a bicycle gets you places without polluting the air, while a car gets you places by burning gas that puts pollution into the air.

(Source: Missouri Botanical Garden's Earthways Center and the U.S. EPA, In the Air curriculum, K-3 Education Module)

Visible and Invisible Air Pollution

- Gather together needed materials: yellow and blue powdered drink mixes, squeezable bottles, and several large sheets of scrap paper (newspaper is fine) for the demonstration or for each group. Either the teacher can demonstrate the experiment to the class, or divide the class into groups of approximately six students each.
- Fill one squeezable bottle with yellow drink mix and water. Fill the other bottle with blue drink mix and water. Put large sheets of paper on the floor or table where the students will be making "pollution." Position the papers at a full arm's length extended from the body.
- Tell students that we all need clean air to breathe and keep us healthy. But sometimes the air gets dirty, or polluted. Tell them that some air pollution can be seen, but other air pollution is invisible. Tell students that the squeezable bottles are like smokestacks from factories, which sometimes release pollution into the air. The different colors in the bottles are like air pollution coming out of the smokestacks. The blue color is like air pollution that you can see. The yellow color is like invisible air pollution.
- Let students take turns shaking the closed bottle of the yellow mix and water. Then open the spout and tell the students with the bottles to extend their arms away from their bodies and over the paper. Help them squirt the bottle hard straight into the air above the paper. Repeat the activity with the second squeezable bottle filled with the blue mix and water.
- Ask students which color was easier to see (*Answer: blue*). Tell students that the blue color, which was easy to see, is like air pollution you can see. The yellow, which was harder to see, is like some pollution that is invisible or not very easy to see. Both kinds of pollution exist in our air. Both visible and invisible pollution can affect people, like making it harder to breathe.

(Source: Indiana Department of Environmental Management, Activities, Lesson Plans, and Coloring Books, Environmental Education Plans, Air Quality, Clearing the Air lesson, Activity #2, www.in.gov/idem)

Milkweed Polka Dots

- In this Internet activity, students learn that plants can be damaged by air pollution (ground-level ozone pollution, in particular). Students examine photos of milkweed leaves, which typically display black dots on their top leaf surfaces when stressed by high amounts of ground-level ozone. Students compare ozone damage to other types of damage.
- Introduce students to both milkweeds and monarch butterflies on the following Web page: <http://dnr.wi.gov/org/caer/ce/eeek/veg/plants/milkweed.htm>.

(Since the URLs for this Web page and the next one are long, you may want to first save them to your "Favorites" list for easy access.) Let students know that monarch butterflies lay their eggs on milkweed plants and that monarch caterpillars eat the leaves. If you are able to find one, show students a healthy milkweed leaf.

- Go to the following Internet Web page to view milkweed damage from ozone pollution: <http://dnr.wi.gov/org/caer/ce/eeek/teacher/milkweed.htm>. Have students study the photo of the ozone-damaged leaf. Discuss the symptoms of milkweed damage from ozone pollution with students: small black dots on the top (not bottom) of the leaves; damage to the leaf, not the veins; damage that won't rub off or wash off. On this same Web page, click on "See the list of slides." Either have students pick a few of these slides to compare with the ozone-damaged leaf photo, or allow them to view the entire slide show. Share with students the information provided on some slides regarding how the damage shown differs from ozone damage to milkweed leaves.

(Source: EEK! Teachers Pages – Milkweed Monitoring Project, <http://dnr.wi.gov/org/caer/ce/eeek/teacher/milkweed.htm>)

More Activity Ideas

- Make a clean air kite.
- Draw a picture of your favorite clean air environment (e.g., a park, forest, lake).

Grades 3-5

Lung Capacity

- In this activity, the teacher demonstrates "lung capacity" to the class—the amount of air that you can hold in your lungs. Tell students that doctors and nurses sometimes measure lung capacity to see how well a person's lungs are working. Also tell students that air pollution can reduce a person's lung capacity. A person with reduced lung capacity breathes less air into his or her lungs. Reduced lung capacity can contribute to heart and lung diseases. Access this experiment at: www.tryscience.org/experiments/experiments_begin.html?lung.

(Source: Tryscience, IBM Corporation, New York Hall of Science, and the Association of Science-Technology Centers, Experiments, Lung Capacity)

Tomorrow's Air Quality Index (AQI)

- As homework, tell students to find your local Air Quality Index (AQI) forecast for the next day and report it to class tomorrow. Tell students to try to find the AQI forecast for tomorrow in local newspapers, which is often on the weather report page, and cut it out. Or, they can try to find the AQI on the Internet at www.airnow.gov, print it out, and bring it to class. If they hear the AQI forecast for tomorrow on the radio or TV, they can report what they heard to the class. The teacher should bring in his or her own AQI information to verify students' responses. In class the next day, discuss students' results and the AQI (e.g., colors, meanings, health effects, what students can do to protect their health on days with poor air quality).

Air Quality Crossword Puzzle

Directions

Fill in the crossword puzzle with your answers to the questions below.

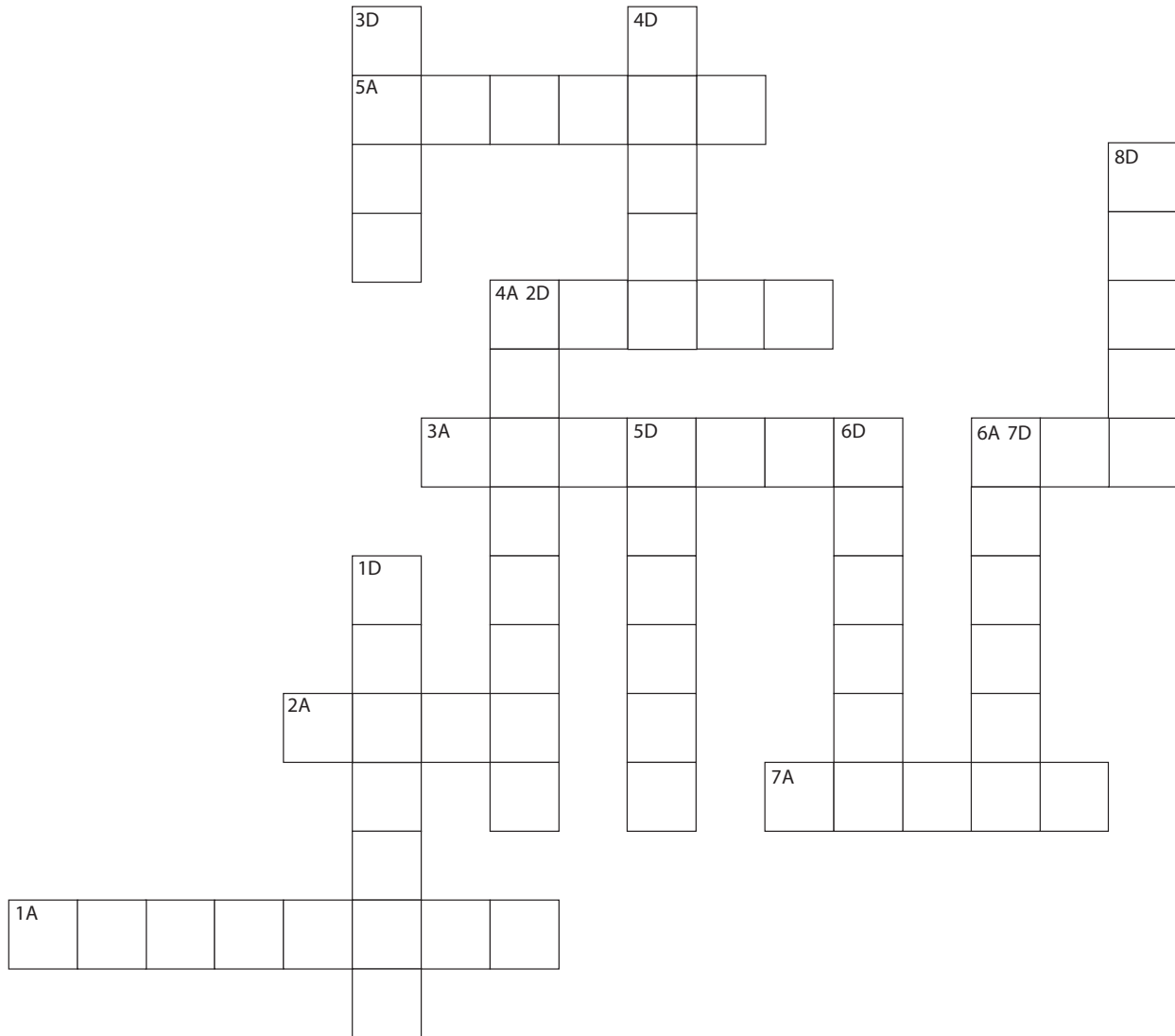
Across

- 1A. What we call the air when it is dirty from things like dust, soot, or chemicals.
- 2A. In addition to power plants and factories, these moving things that take us places can pollute the air.
- 3A. Tell an adult if you find it harder to _____ on a day when the air is polluted.
- 4A. Forest _____ can pollute the air.
- 5A. The name of the Web site where the AQI can be found.
- 6A. We need to breathe _____ to live.
- 7A. The AQI color that means the air quality is "good."

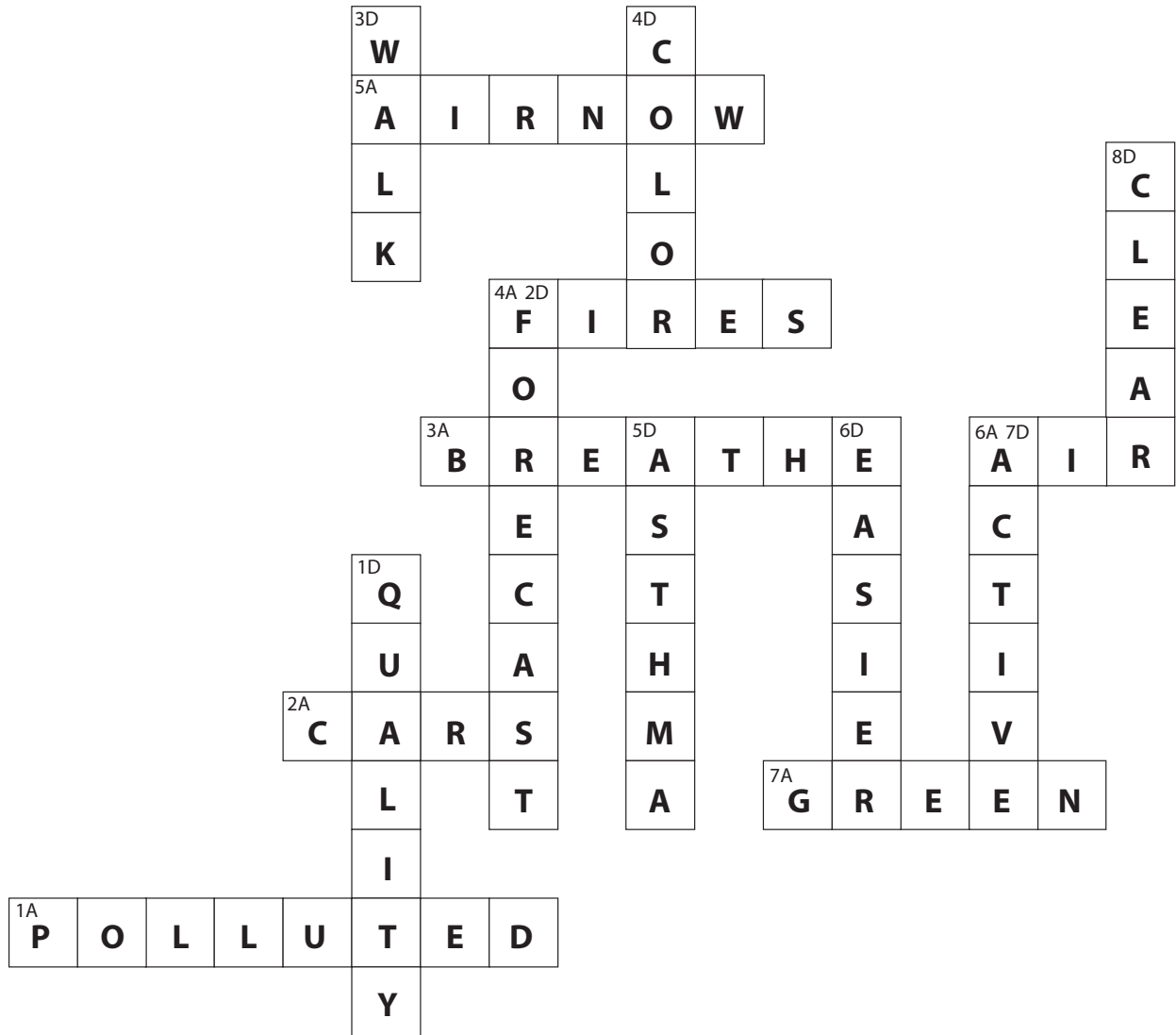
Down

- 1D. "AQI" is an acronym for the Air _____ Index.
- 2D. You might hear about the AQI on the TV, or see it in the newspaper, as part of the weather _____.
- 3D. You might want to do this instead of run on days when the air is polluted.
- 4D. If possible, find out what _____ the AQI is for today and tomorrow.
- 5D. Air pollution can make this breathing problem worse.
- 6D. Take it _____ when you're outside when the air is polluted.
- 7D. We breathe faster and more deeply when we're _____ than when we're resting.
- 8D. Most of the time, when the air is not polluted, it is _____.

Air Quality Crossword Puzzle



Answers to Air Quality Crossword Puzzle



What's Your A.Q.I.Q.? (Air Quality Intelligence Quotient): True or False

Student Worksheet:

Circle "true" or "false" as the correct answers for the statements below.

- | | | |
|--|------|-------|
| 1. Air pollution is only a problem in big cities. | True | False |
| 2. Dirty air is costly to every American. | True | False |
| 3. When the air is polluted, you can always see and smell it. | True | False |
| 4. Clean air is the responsibility of industry alone. | True | False |
| 5. The only health effect of ozone pollution is coughing. | True | False |
| 6. Cars contribute a lot to air pollution problems. | True | False |
| 7. Air pollution is now under control and will not be a problem in the future. | True | False |

What's Your A.Q.I.Q.? (Air Quality Intelligence Quotient): True or False

Teacher Answer Sheet:

1. **Air pollution is a problem only in big cities.** *False.* Everyone is affected by air pollution. The air we breathe does not usually stay in the same place, hovering over us. Oftentimes the air moves. Wind carries pollution to us from hundreds of miles away. Also, the pollution that we produce, no matter how small an amount it may seem, can be significant when combined with everyone else's "small amounts."
2. **Dirty air is costly to every American.** *True.* We pay in health problems caused by air pollution, and the cost of treating people with those health problems. Also, we pay hidden costs in the price of things we buy, for example, the cost of new technology to reduce air pollution. It is frequently less expensive to prevent pollution from occurring in the first place, rather than cleaning it up after it pollutes the air.
3. **When air is polluted, you can always see and smell it.** *False.* Some pollutants are odorless and colorless (such as ozone). That is why it is important to find the Air Quality Index (AQI) in the newspaper, on your favorite news station, or on the Internet (at: www.airnow.gov).
4. **Clean air is the responsibility of industry alone.** *False.* We all have an important role to play in improving our air quality. Choices you can make to improve air quality include turning off lights, TVs, and computers when not using them, and walking, bicycling, or taking a train, bus, or subway (with adult permission) instead of driving places in a car, when possible.
5. **The only health effect of ground-level ozone pollution is coughing.** *False.* Ozone pollution can cause people to cough, but it can also affect our lungs—it can make it harder to breathe, and make asthma worse.
6. **Cars contribute a lot to air pollution problems.** *True.* The automobile industry has made some improvements in equipment in cars that helps reduce pollution, and individual cars and buses release fewer pollutants into the air today than before. However, more people are driving today than ever, and that adds up to a lot of pollution.
7. **Air pollution is now under control and will not be a problem in the future.** *False.* Ozone and particle pollution are still serious problems in many locations in the United States. We all need to be aware of how our activities contribute to pollution and find ways to reduce air pollution and protect our health from the effects of air pollution.

(Source: Ozone Action! Let's Clear the Air. West Michigan Clean Air Coalition, Education, Educational Packet 6-8, www.wmcac.org)

Concept Map

- Have students develop their own concept maps on air quality. For information on concept maps, see: www.inspiration.com/visual-learning/concept-mapping
- Have the class make a list of key words relating to air quality, for example, some of the vocabulary words in the lesson plans and fact sheets in this toolkit. Examples of possible key words are: air pollution, emissions, ozone, particle pollution, AQI, smog, visible, invisible, health, breathing problems, cough, heart problems, temperature inversion, school bus, cars, factory smokestacks, asthma, car tailpipes, dirty windows.
- In class or as homework, have students begin by writing the words "air quality" in the middle of a blank page (preferably unlined paper). Tell them to add words that relate to air quality, and add lines to connect the related words. Have them add "connecting words" on the lines so that each statement makes sense (an example is "can cause" between "air quality" and "breathing problems" and between "air quality" and "air pollution"). Tell students that they can extend the branches out to three or four branches, and that they should try to include examples and words from their own personal experiences. Tell students they should also include pictures and colors in their concept maps. Have students share their maps with the class, and hold a class discussion.

More Activity Ideas

- Write a clean air poem.
- Make a poster showing what people can do to protect their health when air quality is not good (see *Breathe Smart! Four Things Kids Can Do* handout in this toolkit).
- Make a poster showing what people can do to improve air quality (see *Breathe Smart! Four Things Kids Can Do* handout in this toolkit).
- Make a poster showing poor air quality (e.g., pollution from vehicle tailpipes, particle pollution on windows, smokestacks) and good air quality. Remind students that air pollution can also be invisible.

Grades 6-8

- **Create a timeline** linking industrialization to air quality.
- **Write an essay.** Tell students: You live in a biosphere because there is no clean air left outside of it; write 10 of your thoughts/feelings about this. Have students read the essays in class and discuss.
- **Write a report.** Tell students: You are a local elected environmental official. What environmental regulations might you pass? Consider important issues in your community (e.g., air quality in the community), and what barriers you might encounter (e.g., industry doesn't want to spend more money on controlling air pollution; no public transportation exists in your community). Read and discuss the reports in class.
- **Write a jingle/song** encouraging people to improve air quality.
- **Take a series of photographs** on air quality and display them on poster board. Share students' photo displays with the class/school.

(Source: Flight for Life, www.nb.lung.ca/FFL/)

- **Research "green" vehicles**, as described in the following activity.

Green Vehicles

Through class discussion and online resources, students learn about "green" vehicles—those that are more fuel-efficient and/or produce less air pollution emissions—and "shop" for their first car.

Ask students what they think "green" vehicles are. Then tell them that "green" vehicles can refer to vehicles that are either energy-efficient, produce less air pollution, or both. Ask students why they think most vehicles on the road today are not "green." Most cars today burn gasoline made from oil to produce energy to move the vehicle forward. Burning gasoline releases emissions into the air that contain air pollutants or pollutant-forming substances. Because the number of vehicles on the road, and the miles they travel, have almost doubled since 1970, air pollution is still a serious problem. Decreasing amounts of oil available to produce gasoline is also a major concern.

Describe several types of green vehicles to the class, including:

- **Hybrid vehicles** – are more energy-efficient than conventional cars because hybrids use electricity part of the time instead of gasoline; at other times they use gasoline. Hybrid cars may or may not produce less air pollution emissions.
- **Low emission vehicles** – produce less air pollution than older gasoline-powered vehicles. There are also "ultra-low," "super-ultra low," "partial zero," and "zero" emission vehicles. Most newer vehicles now meet low emission or ultra-low emission requirements. Electric and fuel cell vehicles are examples of zero emission vehicles.

Green Vehicles (continued)

- **Alternative fuel vehicles** – use fuels other than gasoline, such as biofuels made from biomass (natural materials such as plants and biodegradable wastes), ethanol, and methanol. Propane or natural gas can also be used; these produce air emissions, but less than gasoline-powered vehicles.
- **Electric cars** – run completely on electricity instead of gasoline, and produce no air emissions.
- **Fuel cell vehicles** – use hydrogen instead of gasoline; other chemicals could also be used, but these would most likely produce some air emissions (while fuel cells do not), although less than using gasoline.

Hybrids are currently available to buy commercially. Vehicles powered by ethanol in combination with gasoline are also readily available. The other types of green vehicles or alternative fuels are generally not yet commercially available, but much research is being conducted on them.

Ask students: If you were going to buy your first car next week, what things would you look for? (Probable answers: color, speed, cost, special features.) Ask them if they would consider how much gasoline a vehicle uses (miles per gallon), and much fuel would cost to fill up the tank (how “fuel-efficient” the vehicle is). Ask them if they would consider how much air pollutant emissions a car produces.

- With students, visit EPA's Green Vehicle Guide Web site at www.epa.gov/greenvehicles/Howto.do and compare hybrids to other makes and models.
- Also visit the U.S. Department of Energy's and EPA's Fuel Economy Web site at www.fueleconomy.gov/feg/findacar.htm, which compares vehicles based on miles per gallon, annual fuel cost, and EPA pollution score.

For more information on green vehicles, see the Web site:
www.sdrafvc.org/PDFS/CarsCarsCars05.pdf.

Also let students know that properly maintained vehicles pollute much less and get better gas mileage. Tell them that they can encourage their family to keep vehicle engines properly tuned and tires properly inflated, and not to top off the gas tank when fueling – gas spills evaporate and contribute to smog. Also tell them that turning off a car when it's standing still (like when you're waiting for someone to come out of his or her house), rather than keeping it going at such times (known as “idling”), reduces air pollution and saves gasoline.

Summarize by telling students that one of the best ways to protect air quality is to reduce our use of gasoline-powered vehicles when possible and switch to cleaner fuels when available. Using buses, bicycles, subways, trains, and car pools, or walking places instead of using cars, helps keep the air clean.

(Source: American Lung Association of San Diego and Imperial Counties, CA, Education, Cars, Cars, Cars Lesson Plan & Teacher's Guide)