

## Elementary School Lesson Suggestions (Grades 3-5)

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### Essential Questions

- How do car emissions affect my environment?
- How is the health of the environment connected to my personal health?
- What can I do to help make a healthier environment for me, and for those in my community?

### Outcomes

- Students will be able to define and demonstrate the concept of idling.
- Students will investigate the connection between car idling, air pollution and personal health.
- Students will inquire, research, and draw conclusions on the subject.
- Students will interpret findings in graph formats.
- Students will build awareness about the harmful health effects of idling.
- (for CASEO) Students will analyze idling habits in their community, collect and interpret data, chart data, and take action to reduce idling in their community.

### Common Core State Standards, ELA: Reading & Writing

- [CCSS.ELA-Literacy.RI.5.3](#) Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- [CCSS.ELA-Literacy.W.5.7](#) Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

### Service Learning Components

The CASEO Carbon Cruncher program meets all of the following Service Learning standards: meaningful service, youth voice, link to curriculum, reflection, progress monitoring, duration & intensity. (For more information on standards, see <http://www.nylc.org/k-12-service-learning-standards-quality-practice>.)

### Materials & Preparation

- paper, pen and clipboards for tracking idling data
- drinking straws and stopwatch for breathing investigation
- stickers, index cards, ribbon, magnifying glasses for Pollution Catcher experiment. For preparation instructions, see <http://www.raftbayarea.org/readpdf?isid=394>
- Print microscopic view of pollutants (or share via a computer) [http://www.teachengineering.org/collection/cub\\_/lessons/cub\\_air/cub\\_air\\_lesson02\\_pollutants.pdf](http://www.teachengineering.org/collection/cub_/lessons/cub_air/cub_air_lesson02_pollutants.pdf)
- Vinegar, large bowl, and spoon for invisible pollution investigation
- Parent volunteers for experiments
- Chart paper, sticky notes for t-chart: "Facts" | "Thoughts"
- "Asth-math" printable
- Rear View Mirror Hang Tag printable

- Review Inquire, Investigate and Act activity suggestions. Review Suggested Reading List. Plan and prepare according to selected activities.

### **Vocabulary**

air quality, air quality index, asthma, carbon emissions, carbon monoxide, environment, idling, particulate matter, pollution

### **Activities**

#### **Inquire** (1 class period)

- Share with students the following short animation from the EPA. This offers a scientific explanation of particle matter that makes up pollution. Ask them to write an explanation of air pollution before and after the animation. How did their answers change? <http://www.epa.gov/airnow/pm/pm.html>
- Engage students by asking them what they already know about the connection between idling, air pollution, and their health. Review vocabulary words with class. Create a class list of what students would like to know and what they expect to learn. Break students into teams. Ask each team to choose one item from the class list for the subject of their investigations.
- Encourage students and parents to participate in The Clean Air for Schools: Engines Off program (CASEO) if they are interested.

#### **Investigate & Analyze** (1-3 class periods)

Select from the whole group or small group activities to have student groups investigate relevant answers to their selected items. Ask each team to record "Facts" & "Thoughts" with sticky notes on a large t-chart, as they investigate:

#### **(small group investigations)**

- (internet only) **Pollution Game** Have students experiment with the air quality variables in the Pollution Game Smog City 2 <http://www.smogcity2.org/smogcity.cfm?preset=particle>
- (print or internet) **Microscopic Pollutants Art** Have students examine a microscopic view of air pollutants and then select one to illustrate: [http://www.teachengineering.org/collection/cub\\_/lessons/cub\\_air/cub\\_air\\_lesson02\\_pollutants.pdf](http://www.teachengineering.org/collection/cub_/lessons/cub_air/cub_air_lesson02_pollutants.pdf)
- (print or internet) **Reading Nook** Ask students to explore: How Much Air Pollution Comes from Cars? How do Catalytic Converters Work? And, 6 Most Common Air Pollutants  
<http://www.epa.gov/airquality/urbanair/>  
<http://auto.howstuffworks.com/air-pollution-from-cars.htm>  
& <http://auto.howstuffworks.com/catalytic-converter.htm>
- (print or internet) **Reading Infographics** Have students review graphics and information on this Air Pollution Bulletin Board <http://bit.ly/1g6SNZC>
- (open space setting) **Burpees & Breathing** Invite student pairs to do burpees or other stationary cardio exercises at full speed for 30 seconds (while other student pairs time them.) After completing the exercise, get students to "experience" the restriction of airflow during an asthma attack, by breathing through a drinking straw while plugging nose. After completing the cardio investigation, students can learn more about asthma here [http://kidsasthmaproject.com/asthma\\_lungs.html](http://kidsasthmaproject.com/asthma_lungs.html) and here: [http://kidsasthmaproject.com/what\\_is\\_asthma.html](http://kidsasthmaproject.com/what_is_asthma.html)

- (printable & internet) **Asth-math!** Give students the Asth-math" printable where students work through percentages and go on a webquest to answer questions particular to their community.
- (internet or newspaper) **AQI Prediction** Ask students to view the Air Quality Index (AQI) Color Chart. What do the colors mean? <http://www.airnow.gov/index.cfm?action=aqibasics.aqi#sens> Have students make a prediction about the Air Quality for their zipcode. Then have students enter their zipcode here: [http://www.airnow.gov/index.cfm?action=airnow.local\\_city&zipcode=80210&submit=Go](http://www.airnow.gov/index.cfm?action=airnow.local_city&zipcode=80210&submit=Go) Students can compare their prediction to the actual air quality.
- **Pollution Experiment** Each group can make a "Pollution Catcher" and place in a different location around the school to catch pollution for one week. (source: <http://www.raftbayarea.org/readpdf?isid=394>) Number each "Pollution Catcher." Create a class list of the "Pollution Catchers" and their locations. Have students predict what sort of pollution the Catchers will catch and which Catcher will catch the most and the least pollution. (Analyze results daily or after one week.)

### (whole class investigations)

- **Invisible Pollution** Google "air pollution" or select air pollution images from picture books to share with class. Explain to the class that while some air pollution is *visible*, other pollution is *invisible*. Ask the class to turn to the back of the room. Pour vinegar into a large bowl. Walk around the class. Ask students to open their eyes. Have them share with their neighbors whether they can smell something in the air, and whether or not they can see it. Explain to students that some pollutants in the air, such as carbon monoxide (CO), are both *invisible* and *odorless*. Have students brainstorm why pollutants that are invisible and odorless may be especially dangerous to our health (e.g. we might not know it's there, reason for carbon monoxide detectors in homes, etc.) Share with students that CO at high levels is toxic to all living things, and that a primary source of CO in our environment comes from vehicle emissions.
- **Idling Tally & Graphs** Create a 5-day idling observation. Break students into parent-led groups. Each day, have one group tally the number of cars idling during the last 15 minutes of the school day. After each day have students record the number of cars idling on a bar or pictograph. Have students record or share their thoughts on the idling data. Why would turning the car off be better for the environment than idling the car?

### Act (Time Varies)

Ask student teams to share their most impactful research findings. How do their findings compare to their predictions? Now that students have investigated the harmful effects of carbon emissions on air quality and health, are they concerned about the effects of poor air quality on their own health? Might they be concerned about their friends with asthma? Do they feel compelled to take action? Encourage students to act in a way that makes sense to them.

Allow student groups to choose one of the following synthesis activities:

- **(Public Service Announcement)** Students make a video, skit or comic depicting a Public Service Announcement (PSA) about what they've learned. For example, a student PSA could explain why one should "Never jog near idling vehicles!"
- **(Commercial for a Carbon Monoxide Reducing Invention)** Students make a commercial (as a skit, video or storyboard) that highlights an invention of their own creation that reduces carbon emissions or stops drivers from idling. For example, students could invent a key magnet that reaches into the driver's seat and turns off the car if driver is idling.

- **(Rear View Mirror Hang Tags)** Students use what they have learned to create slogans and illustrations for Rear View Mirror Hang Tags for their parents' cars.

If students are Carbon Crunchers in the CASEO program, they can utilize the scientific method to hypothesize, experiment, and track and analyze data found regarding idling at their school. Students can also chart and make a graphic representation of the data to share with the entire school community.

### **Extension**

Students write a letter to their families sharing their knowledge and building awareness about the harmful effects of car idling.