

**Little Steps.  
Big Impact.**

# **Air Quality Curriculum Unit**

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# Little Steps. Big Impact.

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## **Welcome**

This curriculum unit is part of the “Little Steps, Big Impact” (LSBI) air quality awareness and education campaign, which is facilitated by the Omaha-Council Bluffs Metropolitan Planning Agency (MAPA) .

The main focus of the campaign is to make the community more aware of the air quality problems that exist in our area - and to encourage residents of the Omaha-Council Bluffs metro area be part of the solution by taking “Little Steps to make a Big Impact” on local air quality. By choosing to use this curriculum unit, you are helping your students and members of your school community take some of those little steps that can have a big impact on the air we breathe!

## **Overview of Unit**

This curriculum unit provides information, resources and links to help you introduce the concept of air quality to your students, as well as suggestions for how you can help your students become citizen scientists and collect their own data about local air quality. The unit aligns with both Nebraska and Iowa Science Standards in addition to Next Generation Science Standards.

Suggestions are provided on how you might share the data with your school/community, in addition to ideas about how to use what your students have learned to educate others. There are templates provided for how you might use this unit with your students, depending on how much time you are able to spend. There are also many additional resources and links provided that will allow you to extend learning if time allows.

Links will be provided for lesson plans geared primarily toward upper elementary school students, with a focus on grades 3-5. However, information and lessons could be adapted for whatever level of students you teach with the help of provided resources. In the resources section, there are also links to lessons and material designed for early elementary and secondary students.

## Resources to support the unit:

The LSBI program has six hand-held air quality monitoring devices which can be used to supplement classroom lessons on air pollution. The monitors can be used to measure air quality around your school/neighborhood to help students understand the impact of vehicle emissions on air quality. That information can help students to learn more about environmental sustainability, clean air, and the impacts of air pollution.

Upon request, MAPA will deliver the devices to your school and provide training to teachers and students on their use. There is no charge for the use of the devices.

Guest speakers can also be arranged through MAPA. These speakers can visit your school to present information about air quality to students and community members.

Guest speakers:

Dan May - City of Omaha Air Quality Division

Russ Hadan - Douglas County, NE Air Quality Department

\*\*To arrange for any of these resources, please contact MAPA at 402-444-6866.

The Environmental Protection Agency provides many online and hard copy resources for educators at no charge. In the “links to resources” section of this document, there are many links to EPA resources and this [link to finding and ordering resources](#).

In addition to digitally downloading resources from the EPA, there are books, posters, bookmarks, and more that you can order hard copies of for free. The ordering process can be done quickly online, but it can take a few weeks to receive the supplies in the mail so plan accordingly.

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There is a PowerPoint presentation that can be used to support your teaching with images and videos. It can be downloaded from the Little Steps Big Impact website. Once you have downloaded it, feel free to adapt it for use in your classroom.

We have provided a data collection template that can be downloaded from the Little Steps Big Impact website. You can use it as is, or adapt it for use in your classroom.

**“Science and everyday life cannot and should not be separated.”  
--Rosalind Franklin, contributed to the discovery of DNA**

Nothing is more a part of everyday life than the air we breathe. Most of us don't give it a second thought, but we could not survive without it. And when the quality of the air around us suffers, our quality of life suffers.

### **Introduction for Teachers : Why teach about air pollution?**

Over the past few decades, instruction about environmental issues has become more prominent in our classrooms. From as early as preschool, children are learning about topics like recycling and water conservation. However, one environmental topic that sometimes gets less focus is that of air quality - despite it being a growing concern for scientists.

Air Pollution and Health : Through regulation and voluntary change, levels of many air pollutants have decreased significantly in recent decades. Still, in many parts of the U.S., the air is often polluted at levels that can affect our health. Millions of people are exposed to unhealthful levels of ground-level ozone or particle pollution every year.

#### Local Impacts - It's a bigger problem than you think.

In an area where people spend so much time outdoors, it's hard to imagine that we have an air quality problem – especially since ground-level ozone is odorless and colorless. But there's increasing evidence that humans are more affected by ozone pollution than previously thought.

Though the air in the Omaha-Council Bluffs metro area *appears* relatively clean, health studies have shown that levels of ozone typical of the Omaha area can cause a variety of health problems including chest pain, coughing, throat irritation, and congestion. Particularly susceptible are young children, the elderly, people with prior lung problems like emphysema, bronchitis, and asthma, and, to a lesser degree, otherwise healthy individuals who work or exercise outdoors.

As a result of this information, the U.S. EPA lowered the acceptable level of ozone in 2015 to 70 parts per billion (ppb). On an average hot day, the Omaha-Council Bluffs Metro is close to exceeding the new level. “Non-attainment” means that there is too much ground-level ozone in our air and the area is over the EPA limit.

## Then what?

If our area goes over the ozone standard, several things could happen:

- Stricter pollution controls that can create serious economic development consequences
- Increased paperwork and reporting for business
- More state oversight and control by the EPA
- Possible limits to transportation improvements that get funded

It was with this prospect in mind that the City of Omaha joined with the States of Nebraska and Iowa, the EPA, the Metropolitan Area Planning Agency (MAPA), and interested stakeholders from the metro area in the Ozone Community Based Planning Process. The “Little Steps, Big Impact” project was a result of this work.

## Air Quality Background Info

Ozone: What is ozone? Ozone is an odorless, colorless gas composed of three atoms of oxygen. Ozone occurs naturally in the Earth’s upper atmosphere (the stratosphere) and as a pollutant at ground level. Stratospheric ozone protects us from the sun’s harmful ultraviolet rays. This beneficial ozone is gradually being destroyed by man-made chemicals. There’s been some progress in restoring the protective layer of ozone in the stratosphere harmed by man-made chemicals but it could take decades for it to be restored to an adequate level. At ground level, ozone is a harmful pollutant formed when emissions from vehicles, power plants, and industrial sources react in the presence of sunlight and heat.

When and where is ozone a concern? Because it needs heat to form, ozone pollution is a concern in warmer weather, particularly in the afternoon and early evening. Ozone can be transported by winds hundreds of miles from where it formed, so it can be found in both urban and rural environments.

Can we see ozone in the air? By itself, ozone in the air is invisible, so we can be breathing harmful ozone levels even when the air looks clear. When ozone mixes with particles (described below), it forms a brown summertime haze known as “smog.”

Why is ozone pollution bad? Ozone can trigger a variety of health problems, even at relatively low levels. Health effects from ozone include aggravated asthma and increased susceptibility to respiratory illnesses like pneumonia and bronchitis. Symptoms to watch for when ozone is in the air include coughing, pain when taking a deep breath, and breathing difficulties, especially when you are active outdoors. But ozone damage can also occur without any noticeable signs. And, for some people, several months of repeated exposure to ozone can permanently

damage the lungs. Ozone is also bad for our environment, damaging plants and trees and reducing crop and forest yields.

Who's at risk from ozone pollution? People with respiratory problems are most vulnerable, but even healthy people and children who are active outdoors can be affected when ozone levels are unhealthy. This is because during physical activity, ozone penetrates deeper into the parts of our lungs that are most vulnerable to ozone.

## **All About the Air Quality Index**

### What Is the Air Quality Index (AQI)?

The AQI is an index for reporting daily air quality. It uses a simple color-coded scale to tell you how clean or polluted your air is, and how you can protect your health at different levels of pollution. The AQI helps to make daily air quality information as easy to understand as weather forecasts.

### How Does the AQI Work?

The AQI is essentially a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value greater than 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. When AQI values are above 100, air quality is considered to be unhealthy—at first for certain sensitive groups of people, then for everyone as AQI values get higher.

### What is a Sensitive Group?

Some people are more sensitive to air pollution than other people. Different people can be sensitive to different air pollutants. For example, ozone might make you cough. Particulate matter may not bother you, but it may make your grandmother cough and need to rest.

One sensitive group is people with asthma. Asthma is a disease that can make it hard to breathe and ground-level ozone can aggravate that condition.

Understanding the AQI - To make it easier to understand, the AQI is divided into six categories: Each category corresponds to a different level of health concern and is assigned a color for easy reference.

**“Good”**—GREEN - The AQI value for a particular community is between 0 and 50. Air quality is considered satisfactory, and air pollution poses little or no risk.

**“Moderate”**—YELLOW - The AQI for a community is between 51 and 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.

**“Unhealthy for Sensitive Groups”**—ORANGE - When AQI values are between 101 and 150, members of sensitive groups may experience health effects. This means they are likely to be affected at lower levels than the general public. For example, people with lung disease are at greater risk from exposure to ozone. The general public is not likely to be affected when the AQI is in this range.

**“Unhealthy”**—RED -- Everyone may begin to experience health effects when AQI values are between 151 and 200. Members of sensitive groups may experience more serious health effects.

**“Very Unhealthy”**—PURPLE - AQI values between 201 and 300 trigger a health alert, meaning everyone may experience more serious health effects.

**“Hazardous”**—MAROON - AQI values greater than 300 trigger health warnings of emergency conditions. The entire population is more likely to be affected

## Air Quality Index Description

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>...air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Source: <http://www.epa.gov/aimnow/aqibroch/aqi.html>



## Guide to Air Quality Index Categories



### Resources:

US EPA - AirNow Air Quality Index (AQI) Toolkit for Teachers  
[https://airnow.gov/index.cfm?action=resources.aqi\\_toolkit](https://airnow.gov/index.cfm?action=resources.aqi_toolkit)

City of Omaha Public Works  
<https://publicworks.cityofomaha.org/air-quality-control/ozone>

Metropolitan Area Planning Agency - Little Steps, Big Impact  
<http://littlestepsbigimpact.com/why-is-this-urgent/>

Little Steps Big Impact [Air Quality Emojis](#) and [Emoji Guide](#)

**Nebraska Science Standards Addressed:**

SC.5.13.4.C Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

**Nebraska Math Standards Addressed:**

MA 5.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.

**Iowa Science Standards Addressed:** [Iowa Core Standards Description](#)

Students who demonstrate understanding can: 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

**Iowa Engineering Design Standards Addressed:**

Students who demonstrate understanding can: 3-5-ETS1- 1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

Students who demonstrate understanding can: 3-5-ETS1- 2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

**Next Generation Science Standards Alignment**

**5-ESS3 Earth and Human Activity**

5-ESS3 Earth and Human Activity		
<p>Students who demonstrate understanding can:</p> <p><b>5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.</b></p> <p>The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i>.</p>		
<p><b>Science and Engineering Practices</b></p> <p><b>Obtaining, Evaluating, and Communicating Information</b> Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.</p> <ul style="list-style-type: none"> <li>Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)</li> </ul>	<p><b>Disciplinary Core Ideas</b></p> <p><b>ESS3.C: Human Impacts on Earth Systems</b></p> <ul style="list-style-type: none"> <li>Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. (5-ESS3-1)</li> </ul>	<p><b>Crosscutting Concepts</b></p> <p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>A system can be described in terms of its components and their interactions. (5-ESS3-1)</li> </ul> <p>-----</p> <p><b>Connections to Nature of Science</b></p> <p><b>Science Addresses Questions About the Natural and Material World.</b></p> <ul style="list-style-type: none"> <li>Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)</li> </ul>
<p><i>Connections to other DCIs in fifth grade: N/A</i></p> <p><i>Articulation of DCIs across grade-levels: MS.ESS3.A (5-ESS3-1); MS.ESS3.C (5-ESS3-1); MS.ESS3.D (5-ESS3-1)</i></p> <p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy –</i></p> <p><b>RI.5.1</b> Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1)</p> <p><b>RI.5.7</b> Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.(5-ESS3-1)</p> <p><b>RI.5.8</b> Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)</p> <p><b>W.5.8</b> Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1)</p> <p><b>W.5.9</b> Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)</p> <p><i>Mathematics –</i></p> <p><b>MP.2</b> Reason abstractly and quantitatively. (5-ESS3-1)</p> <p><b>MP.4</b> Model with mathematics. (5-ESS3-1)</p>		

## **Essential Questions for the Unit**

How do humans contribute to ground-level ozone pollution?

Why might different parts of the country have higher ozone pollution?

How might the amount of air pollution from traffic be reduced?

What might some of the benefits be of reducing traffic and air pollution from vehicles?

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?

## **Learning Objectives For the Unit -- Students will:**

Discover that ground-level ozone occurs in many areas of the country

Discover that ground-level ozone problems are often associated with high-population centers.

Be able to define Air Quality Index (AQI).

Be able to read and interpret a graph or data table containing AQI information.

Be able to define and demonstrate the concept of idling.

Investigate the connection between car idling, air pollution and personal health.

Inquire, research, and draw conclusions on the subject.

Interpret findings in graph formats.

Build awareness about the harmful health effects of idling.

Create a plan to share what they have learned with the school community

## Vocabulary Words

**Air Pollution**—Occurs when too much dirt or too many chemicals get into the air and make it dirty.

**Air Quality Index**—(younger students) Colors and numbers used to tell how clean or dirty the air is.

**Air Quality Index (AQI)**—(older students) A color-coded scale that provides daily air quality and health information.

**Asthma**-- Asthma is a disease that can make it hard to breathe.

**Atmosphere**—The mass of air surrounding the Earth.

**Chemical reaction**—A change that takes place when two or more substances interact to form a new substance.

**Citizen Science** --- A form of collaboration where members of the public participate in scientific research to meet real world problems.

**Emissions**—Substances discharged into the air. Releases of pollutants from a variety of sources and activities, including vehicles, factories, power plants that make electricity, and wood-burning stoves and fireplaces, among others.

**Gas**—Something that is not a solid or a liquid. A gas doesn't have a particular shape, and usually is invisible.

**Global**--- Global means the whole world.

**Hazardous**--- Hazardous means dangerous.

**Haze** --- Soot and dust make the air look hazy

**Idle or Idling**---Inactive, not in use, not moving or in operation.

**Improve**—To make better.

**Ozone**—(younger students) A gas. When ozone is near the ground, it is bad, and is air pollution. Ozone high up in the atmosphere is good, and helps protect us from sunburn.

**Ozone**—(older students) A gas that occurs both in the Earth’s upper atmosphere and at ground level. Ozone can be “good” or “bad” for people’s health and the environment, depending on its location in the atmosphere. High up in the atmosphere, ozone helps protect people’s health from too much ultraviolet radiation from the sun. Near the Earth’s surface, ozone is an air pollutant that can result in breathing difficulties.

**Particle**—A small bit of something, such as dirt or dust.

**Pollutant** ---Pollutants are what make the air dirty and cause pollution. Sometimes you can see pollutants and sometimes you can't. Ozone is a pollutant that you can't see. Dust and soot are pollutants that you can see. Dust and soot are also called Particulate Matter.

**Pollution**—Harmful substance put into the environment, for example into the air, water, or soil.

**Protect**—To keep from being hurt.

**Smog**--- Bad ozone is sometimes called smog. It is formed when chemicals coming out of cars and factories are cooked by the hot sun.

**Soot** ---Soot comes from burning something. When you burn gasoline in your car engine or burn wood in a campfire, soot happens! You may have noticed the walls on the fireplace after a fire has burned. The walls are covered in a black powder. That is soot.

**Temperature inversion**—A layer of warm air that prevents the rise of cooler air and pollutants beneath it.

**Visible**—Possible to see.

## Template for 7 days - 3 days of data collection

There are a few different options for lessons to teach each day - teachers should choose the one that best supports their goals and timeframe.

	<b>Lesson topic</b>	<b>Areas to be addressed</b>
Day 1	<p>Introduction to the concept of air quality and air pollution Introduction to the Air Quality Index and how it works</p> <p><a href="#">The Ozone Between Us Lesson</a></p> <p><a href="#">What color is your air? Lesson Plan</a></p>	<p>Poor air quality is an issue that impacts everyone, especially people with breathing conditions like asthma.</p> <p><u>Students will investigate:</u></p> <ul style="list-style-type: none"> <li>-what factors contribute to poor air quality.</li> <li>-how air quality is measured and where we find information about air quality.</li> </ul>
Day 2	<p>Learn more about how poor air quality impacts health. Make connections between idling cars and poor air quality.</p> <p><a href="#">Idlers:Please Stop Your Engines Lesson Plan</a>(use lesson and activity #1)</p> <p><a href="#">Engines Off! Lessons</a> (several small and whole group investigations to choose from)</p>	<p>In addition to other sources, the vehicles we drive emit chemicals that contribute to air pollution.</p> <p><u>Students will investigate:</u></p> <ul style="list-style-type: none"> <li>-connections between idling cars (especially at schools) and poor air quality</li> <li>- how people with breathing conditions might be negatively impacted by poor air quality</li> </ul>
Day 3	<p>Introduce students to the data collection process</p> <p>Data collection - Day 1</p> <p>If you are using the Air Quality Monitors provided by MAPA, this unit plan contains suggestions on how to collect data.</p> <p>-----</p> <p>If you <u>will not</u> be using the Air Quality Monitors from MAPA you may choose an alternate approach to data collection - here are two options</p> <p><a href="#">Traffic Tally Lesson</a></p> <p><a href="#">Idlers, Please Stop Your Engines Lesson Plan</a>(use activity #2, 3 and 4)</p>	<p>By collecting data about the air quality around them, students can learn more about the local conditions and what factors might contribute to them.</p> <p><u>Students will:</u></p> <ul style="list-style-type: none"> <li>- learn about whichever type of data they will be collecting</li> <li>- be introduced to the materials used in data collection</li> <li>-be introduced to and practice the method of data collection they will be using</li> </ul>

Day 4	Data Collection -Day 2  If time permits, have students do some “Investigate and analyze” activities like those suggested <a href="#">here</a>	Student teams will collect data
Day 5	Data Collection - Day 3  If time permits, have students do some “Investigate and analyze” activities like those suggested <a href="#">here</a>	Student teams will collect data
Day 6	Analyze data and draw conclusions  Students will graph their data - the graphing method will depend on the type of data collected - choose what works best for your class. -If you used the MAPA air quality monitors, an example graph can be found <a href="#">here</a>	Graphing their data gives students a visual representation that will assist them in drawing conclusions.  <u>Students will ask:</u> -What patterns did we notice in our data? -What conclusions can we draw from our data? -What is the data suggesting?
Day 7	Make plans to share what we have learned with others.  This unit plan provides several ideas for how to share what students have learned with others.	Sharing what you have learned is an important part of the scientific process.  <u>Students will investigate:</u> -What could we do to make positive changes to the air quality at our school and in our community? -How can we share what we have learned?

## Template for 5 days - 2 days of data collection

There are a few different options for lessons to teach each day - teachers should choose the one that best supports their goals and timeframe.

	<b>Lesson topic</b>	<b>Areas to be addressed</b>
Day 1	<p>Introduction to the concept of air quality and air pollution            Introduction to the Air Quality Index and how it works            Make connections between idling cars and poor air quality.</p> <p><a href="#">The Ozone Between Us Lesson</a></p> <p><a href="#">What color is your air? Lesson Plan</a></p> <p>**In addition to whichever lesson plan you choose, use the “Idling introduction and discussion” points found <a href="#">here</a></p>	<p>Poor air quality is an issue that impacts everyone, especially people with breathing conditions like asthma.</p> <p><u>Students will investigate:</u></p> <ul style="list-style-type: none"> <li>-what factors contribute to poor air quality.</li> <li>-how air quality is measured and where we find information about air quality.</li> <li>-connections between idling cars (especially at schools) and poor air quality</li> <li>- how people with breathing conditions might be negatively impacted by poor air quality</li> </ul>
Day 2	<p>Introduce students to the data collection process</p> <p>Data collection - Day 1</p> <p>If you are using the Air Quality Monitors provided by MAPA, this unit plan contains suggestions on how to collect data.</p> <p>-----</p> <p>If you <u>will not</u> be using the Air Quality Monitors from MAPA you may choose an alternate approach to data collection - here are two options</p> <p><a href="#">Traffic Tally Lesson</a></p> <p><a href="#">Idlers, Please Stop Your Engines Lesson Plan</a>(use activity #2, 3 and 4)</p>	<p>By collecting data about the air quality around them, students can learn more about the local conditions and what factors might contribute to them.</p> <p><u>Students will:</u></p> <ul style="list-style-type: none"> <li>- learn about whichever type of data they will be collecting</li> <li>- be introduced to the materials used in data collection</li> <li>-be introduced to and practice the method of data collection they will be using</li> </ul>
Day 3	<p>Data Collection -Day 2</p> <p>If time permits, have students do some extension activities like those suggested <a href="#">here</a></p>	<p>Student teams will collect data</p>



<p>Day 4</p>	<p>Analyze data and draw conclusions</p> <p>Students will graph their data - the graphing method will depend on the type of data collected - choose what works best for your class.</p> <p>-If you used the MAPA air quality monitors, an example graph can be found <a href="#">here</a></p>	<p>Graphing their data gives students a visual representation that will assist them in drawing conclusions.</p> <p><u>Students will ask:</u></p> <ul style="list-style-type: none"> <li>-What patterns did we notice in our data?</li> <li>-What conclusions can we draw from our data?</li> <li>-What is the data suggesting?</li> </ul>
<p>Day 5</p>	<p>Make plans to share what we have learned with others.</p> <p>This unit plan provides several ideas for how to share what students have learned with others.</p>	<p>Sharing what you have learned is an important part of the scientific process.</p> <p><u>Students will investigate:</u></p> <ul style="list-style-type: none"> <li>-What could we do to make positive changes to the air quality at our school and in our community?</li> <li>-How can we share what we have learned?</li> </ul>

## Template for 3 days - 1 day of data collection

There are a few different options for lessons to teach each day - teachers should choose the one that best supports their goals and timeframe.

	Lesson topic	Areas to be addressed
Day 1	<p>Introduction to the concept of air quality and air pollution Introduction to the Air Quality Index and how it works Make connections between idling cars and poor air quality.</p> <p><a href="#">The Ozone Between Us Lesson</a></p> <p><a href="#">What color is your air? Lesson Plan</a></p> <p>**In addition to whichever lesson plan you choose, use the “Idling introduction and discussion” points found <a href="#">here - Idlers, Please Stop Your Engines Lesson Plan</a></p>	<p>Poor air quality is an issue that impacts everyone, especially people with breathing conditions like asthma.</p> <p><u>Students will investigate:</u></p> <ul style="list-style-type: none"> <li>-what factors contribute to poor air quality.</li> <li>-how air quality is measured and where we find information about air quality.</li> <li>-connections between idling cars (especially at schools) and poor air quality</li> <li>- how people with breathing conditions might be negatively impacted by poor air quality</li> </ul>
Day 2	<p>Introduce students to the data collection process</p> <p>Data collection</p> <p>If you are using the Air Quality Monitors provided by MAPA, this unit plan contains suggestions on how to collect data.</p> <p>**if you only have time for one day of data collection, we suggest that you collect data twice on that day so students have two sets of data to compare. For example, collect data once at 10:00am and a second time at rider pick-up time.</p> <p>-----</p> <p>If you <u>will not</u> be using the Air Quality Monitors from MAPA you may choose an alternate approach to data collection - here are two options</p> <p><a href="#">Traffic Tally Lesson</a></p> <p><a href="#">Idlers, Please Stop Your Engines Lesson Plan</a>(use activity #2, 3 and 4)</p>	<p>By collecting data about the air quality around them, students can learn more about the local conditions and what factors might contribute to them.</p> <p><u>Students will:</u></p> <ul style="list-style-type: none"> <li>- learn about whichever type of data they will be collecting</li> <li>- be introduced to the materials used in data collection</li> <li>-be introduced to and practice the method of data collection they will be using</li> </ul>

<p>Day 3</p>	<p>Analyze data and draw conclusions</p> <p>Students will graph their data - the graphing method will depend on the type of data collected - choose what works best for your class.</p> <p>-If you used the MAPA air quality monitors, an example graph can be found <a href="#">here</a></p> <p>Make plans to share what we have learned with others.</p> <p>This unit plan provides several ideas for how to share what students have learned with others.</p>	<p>Graphing their data gives students a visual representation that will assist them in drawing conclusions.</p> <p>Sharing what you have learned is an important part of the scientific process.</p> <p><u>Students will ask:</u></p> <ul style="list-style-type: none"> <li>-What patterns did we notice in our data?</li> <li>-What conclusions can we draw from our data?</li> <li>-What is the data suggesting?</li> </ul> <p><u>Students will investigate:</u></p> <ul style="list-style-type: none"> <li>-What could we do to make positive changes to the air quality at our school and in our community?</li> <li>-How can we share what we have learned?</li> </ul>
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## Data Collection

Little Steps Big Impact provides hand held air quality monitoring devices to local classrooms. Students can use them to measure air quality around their school (or other high traffic areas nearby) to help them understand the impact of vehicle emissions on air quality. Students can chart the data in order to learn more about environmental sustainability, clean air, and the impacts of air pollution.

MAPA will provide training to you and your students on how to use the AQM - instructions are also included with the devices.

**\*\*Contact MAPA at 402-444-6866 to learn more or to arrange to borrow the monitors.**

If you are using the air quality monitors (AQM) provided by MAPA, you may choose to show your students one of these brief videos that provide a general overview of the monitors and what they are used for (the videos were created by the company that manufactures the monitors).

[Intro to air quality monitor - video](#)

[Measuring ozone with handheld monitor - video](#)

Before actual data collection begins, you will want to make sure that both you and your students are familiar with the AQM and how they work. You will want to provide guidelines for your students on how to handle the equipment and what job each person in the group has. If time permits, you should have a practice session where students become familiar with the monitors and how to record the readings. Support from additional adults would be helpful during actual data collection to help with supervision and trouble-shooting.

### **Suggestions for data collection process:**

The AQM take readings of the ground-level ozone in the air and can generate a reading approximately every minute. Teachers who have used the monitors usually choose to use them around school dismissal time and to have students stationed in the area where students are picked up by personal vehicles.

You may want to have students begin their monitoring before dismissal time and continue for several minutes. This would allow students to see an upward trend in the ozone readings as pick-up time progresses and more vehicles are idling in the area. There are examples of what that type of data might look like on the [Little Steps Big Impact website](#) where you can see what other local schools have done.

You might also choose to have students take readings at two different times of day so they can make comparisons - for example, students take readings in front of the school at 11:00am when there are no idling cars, and again at 3:15pm when student pick-up is beginning.

MAPA provides a set of six monitors. To organize your class, you can create six small groups so that each group is in charge of one AQM. We have provided suggested jobs/roles for the students in each group. We have also provided a graphic organizer that could be used to collect data, or you can create one that works for your circumstances. You can watch a news story about an Omaha school using the air quality monitors [here](#).

Before beginning data collection, students should fill out the information about where they will be stationed, as well as the current weather and temperature. If you are collecting data over a few days, or at different times during the day, this will help students to notice whether there seems to be a correlation between the location or weather/temperature and the ozone readings.

If you are not using the air quality monitors provided by MAPA, this is an alternate [Traffic Tally Lesson](#) you could utilize. It provides suggestions for students tallying the amount and type of traffic that they find on local roads and using that data to draw conclusions about traffic and air pollution.

Another alternative data collection option can be found here [Car idling lesson plan](#)

#### **Student Jobs based on a group of 4**

<b>Timer:</b>	Your job is to accurately keep track of the time (based on what your teacher has told you) and to start and stop the experiment
<b>Recorder:</b>	Your job is to neatly record each reading as it is called out - make sure to put each amount in the correct box
<b>Reader:</b>	Your job is to read and call out the reading from the screen each time a new reading is generated by the monitor
<b>Holder:</b>	Your job is to safely and securely hold the monitor in two hands - make sure the sensors are not blocked and are not touched by anyone



# Ways for students to share what they have learned about air quality issues

## At school:

Sign your school up to participate in the [Air Quality Flag Program](#). For \$100, you can order a set of colored flags that coordinate with the colors of the Air Quality Index. The appropriately colored flag is flown each day to let those in the school community know what the air quality rating is for that day.

Utilize resources from the EPA's [Air Quality Flag Program](#). It includes things like printable posters and an outdoor activity guide, a sample letter to introduce the program to parents, and activities to do with your students.

Print this [AQI Activity Guide](#) and post it in classrooms and near doors to outside areas. It offers suggestions for how to handle PE, recess and other outdoor activities based on the Air Quality color for that day.

Students can make posters to share information about air pollution around the school.

Examples of some “fun facts” to share can be found here...[Did you know?](#)

Air Quality Emojis found [here](#) would be a fun resource

Have older students pair up with younger students in another classroom to share the book [Why is Coco Orange?](#) The book, about a chameleon named Coco, teaches about air quality.

Empower students to prepare and present their own brief lesson about air quality that they can share with another classroom.

## With Parents/ School Community:

Encourage your school to begin participating in the [EPA Idle Free Schools Program](#). The EPA provides all of the information and resources you would need to run an “Idling Reduction” program at your school - where parents are educated about why letting their cars idle during school pick-up is harmful to air quality. Schools can use all of the materials and follow the recommended schedule as written or can implement an idling reduction campaign of their own, using the materials that fit with the school’s desires and capabilities.

Students can share the [Commit to One Day - Ozone reduction](#) program with the community. For each day of the week, it has a simple action that people can take to help reduce ozone pollution.

Students can create their own Fact Sheet about Ozone pollution and prevention to distribute to parents and the community [Ozone FAQ example](#)

Have students create a [Bumper Sticker](#) with artwork and/or a slogan to stop idling in the car rider line at your school.

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.

[\(Commercial for a Carbon Monoxide Reducing Invention\)](#) 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.

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

The Little Steps Big Impact website shares several ideas that [local students](#) had about sharing air pollution information with others.

## Assessment Tools

Have your students play the [AQI Game Show](#) which tests their knowledge of the Air Quality Index.

Provide students with this paper to write their own personal ideas about air pollution - [Write your own Clean Air Bill](#)

Students are asked to look at an air quality map and answer questions in this [Student Worksheet - The Ozone Between Us](#)

Students must explain how the Air Quality Index works in this activity [How Clean is the Air Today?](#)



# Make your own Air Quality Poster

## Materials needed:

Scissors

Stapler

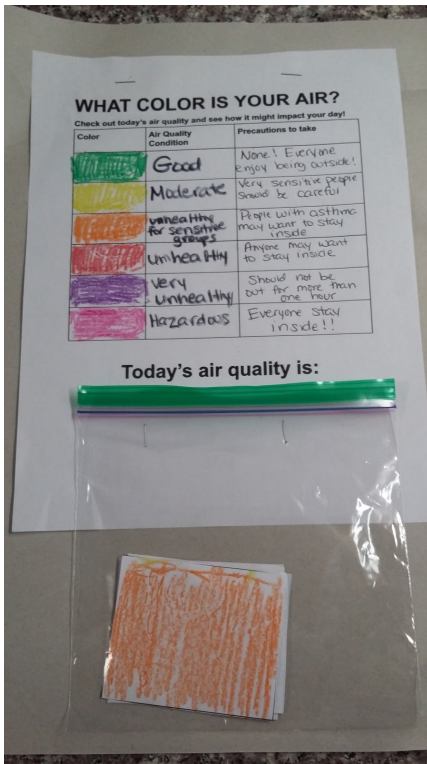
Glue

crayons or markers in the colors of green, yellow, orange, red, purple, maroon

Copies of the “What color is your air?” grid and squares template - 1 copy of each for every poster that will be made

1 plastic bag (sandwich size) per poster

1 legal size (approximate) piece of cardboard or cardstock per poster - use whatever size you have available that will work



## Instructions:

Print off one copy of the “What color is your air?” blank grid and the squares template per poster.

If time allows, have your students research the Air Quality poster found [here](#) or [here](#) and fill in their own grid with the appropriate colors and information.

If you are short on time, there is an Air Quality grid with information that is already filled in. Print one copy for each poster to be made. Students could add the appropriate colors with crayons or markers in the first column.

Have students cut out the six squares and color each square with a corresponding air quality color (green, yellow, orange, red, purple, maroon) Another option would be to print the Air Quality Emojis found [here](#) and use in place of the squares - Emoji Guide Graphic [here](#)

Staple or glue the completed “What color is your air?” paper onto a larger piece of cardboard or cardstock.

Staple a sandwich sized plastic bag to the poster under the words, “Today’s air quality is...”

## Use: Students can take the posters home or post them around the school

Each day, students can check the [EPA's Air Quality Index](#) to find the local air quality rating. They can then put the corresponding colored square in the baggie to make a quick visual display for others. (Store squares that are not in use in the baggie with the white side facing out)

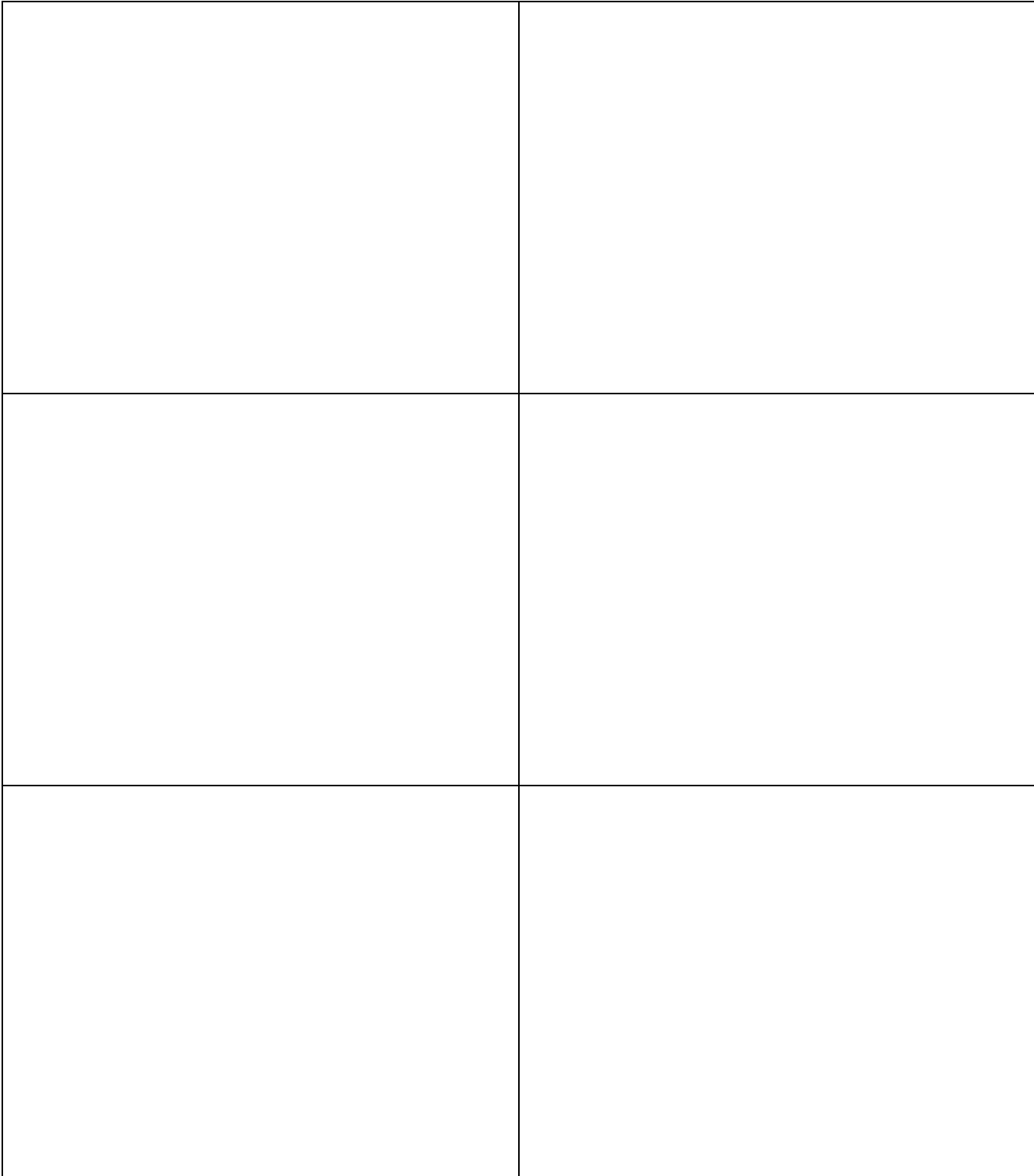
# WHAT COLOR IS YOUR AIR?

Check out today's air quality and see how it might impact your day!

Color	Air Quality Condition	Precautions to take

**Today's air quality is:**

**Cut out each square and use crayons or markers to color each one to match one of the air quality levels - green, yellow, orange, red, purple, and maroon**



# WHAT COLOR IS YOUR AIR?

Check out today's air quality and see how it might impact your day!

Color	Air Quality Condition	Precautions to Take
Green	Good	None - everyone enjoy outdoor activities!
Yellow	Moderate	Exceptionally sensitive people should monitor intense activity
Orange	Unhealthy for sensitive groups	People with asthma or respiratory problems should have the option to play inside
Red	Unhealthy	Any child who complains of difficulty breathing, or who has asthma or other respiratory problems, should be allowed to play indoors.
Purple	Very unhealthy	Restrict outdoor activities to light to moderate exercise not to exceed one hour.
Maroon	Hazardous	Not safe for anyone to be outside for long periods

**Today's air quality is:**

## Links to Additional Resources

[Little Steps, Big Impact](#) - the website sponsored by MAPA which contains examples of how schools in the Omaha metro area have collected data about air quality

### ***Resources from the EPA (Environmental Protection Agency)***

[How to order hard copies of EPA resources](#)

[EPA AirNow Teacher Toolkit](#) - resources and lesson plans to teach students of various levels about air quality

[EPA Idle Free Schools Toolkit](#) - extensive resources to help schools establish an “Idle Free” program - educates parents/community about how idling cars during student pick-up contribute to ozone pollution.

[AQI Activity Guide](#) - recommended outdoor activity levels based on AQI color

[Air Quality Flag Program](#). - a program where schools fly a flag each day representing the air quality for that day

### ***Lesson Plans***

[Stop Idling Lesson Plan](#)

[Engines Off! Lesson Plan](#)

[The Ozone Between Us Lesson](#)

[Clean Air Projects - Elementary Lesson Plans](#)

[Air Pollution lessons for grades 6-12](#)

[Air, Air, Everywhere](#) - 3rd-5th grade lessons and activities from the Wisconsin DNR

["Teach Engineering" air pollution unit](#)

## **Articles**

[Omaha's air quality improves-article](#) - American Lung Association says Omaha air quality has improved

[Improvement in Ozone Layer](#) - Article about how there has been some improvement in the stratospheric ozone layer

[Ozone layer thinning over populated areas](#) - Article discusses how the stratospheric ozone layer over populated areas is thought to be thinning

## **Videos**

[Little Steps, Big Impact - YouTube Channel](#)

[News story about Omaha school using air quality monitors](#)

[Healthy Air Matters video](#)

[Ground level ozone - what is it? Video](#)

[The science of smog - video](#)

[Citizen Science for kids](#) - video

["Turn it off" idling video](#)

[Anti-idling campaign video](#)

[News story about schools and air quality-video](#)

## **Printable Activities**

[Clean air kids - activity booklet](#) - provides a crossword puzzle, word scramble and other worksheets to help teach kids about air pollution

[Spare the Air - activity book](#) - provides a word search, maze, coloring sheets and other worksheets to help teach kids about air pollution

[Air cycle poster](#) - a helpful visual representation of the air cycle of our planet - "What's in the air gets around!"

[Air Quality Emojis](#) - these could be printed to use in student-made air quality posters or other activities / Emoji Guide Graphic [here](#)

# References

Metropolitan Area Planning Agency - Little Steps, Big Impact  
<http://littlestepsbigimpact.com>

US EPA - AirNow Air Quality Index (AQI) Toolkit for Teachers  
[https://airnow.gov/index.cfm?action=resources.aqi\\_toolkit](https://airnow.gov/index.cfm?action=resources.aqi_toolkit)

City of Omaha Public Works  
<https://publicworks.cityofomaha.org/air-quality-control/ozone>

Iowa Core Education Standards  
<https://iowacore.gov/>

Nebraska Education Standards  
<https://www.education.ne.gov/contentareastandards/>

Next Generation Science Standards  
<https://www.nextgenscience.org/>

Teach Engineering Lesson Plans  
[https://www.teachengineering.org/activities/view/cub\\_air\\_lesson01\\_activity3](https://www.teachengineering.org/activities/view/cub_air_lesson01_activity3)

National Jewish Health - Clean Air Lesson Plans  
<https://www.nationaljewish.org/cehc/lesson-plan-packets/elementary-school-plans>

Spare the Air Program  
<http://www.sparetheair.com>

Maricopa County Air Quality Department  
<https://cleanairmakemore.com>