

Topic:	Pre Visit Lesson Plan for the Environmental Monitoring Interactive Stations: <i>Air Quality</i>
Lesson Title:	Just Breathe
Grade Level:	4th Grade
Science Domain:	Earth and Human Activity
Purpose:	Students will learn how and why scientists collect data to learn about air quality.

Connecting to the Next Generation Science Standards:

Students who demonstrate understanding can:	
Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. 4-ESS3-1 Earth and Human Activity	
The materials/lessons/activities outlined below are intended to help students reach the Performance Expectations listed below.	
Performance Expectations:	Connections to Classroom Activity Students:
<i>Science and Engineering Practices</i>	
Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena.	I can gather (read, collect, record) information about air pollution on a website, book or other resource and share with others.
<i>Disciplinary Core Idea</i>	
ESS3.A: Natural Resources • Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	I can collect data on Air Quality from a website and enter the data in a table. I can look for patterns to determine how the way we use energy and fuels affects the environment in multiple ways.

Crosscutting Concept

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change.

Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. Influence of Engineering, Technology, and Science on Society and the Natural World
- Over time, people's needs and wants change, as do their demands for new and improved technologies.

I can identify and explain cause and effect relationships between humans and air pollution.

Teacher Background Information:

When you and your students visit The INFINITY Science Center in Pearlington, Mississippi, you will have the opportunity to interact with the Environmental Monitoring exhibit. This exhibit will showcase specific environment monitoring and research programs and capabilities resident in the Stennis Federal complex. Live data feeds from all parts of the globe, in particular the Gulf Coast region and immediate surrounds at Stennis, are used by visitors to explore their environment while learning about the role of data collection in scientific research. Within the exhibit there are six interactive station covering three topics: ocean conditions, air quality, and river conditions. This lesson plan serves to build background information for you and your students on the air quality portion of the exhibit.

A colorful, graphic-overlaid map of the United States greets visitors as they start the interactive. This represents one of the environmental measurements featured in the exhibit: for instance, the "Air Quality" station displays current Air Quality Index data across the nation. Shades of green indicate safe air; oranges and reds indicate dangerous levels of pollution in the atmosphere. Potentially, the map may change as visitors watch, representing several hours of data and revealing patterns in the way that conditions change over the course of the day.

Primary Content:

Scientists collect a wide array of environmental data at Stennis and across the nation

- Researchers use a variety of interesting techniques to collect this data
- Once collected, environmental data reveal insights that are fascinating in their own right and often prove essential to the public's health and safety.

For additional background knowledge about air pollution, you may choose to watch this video to increase your own understanding of pollution and the effects it can have on the environment and people. Paul Anderson, an educator, writes and produces videos for informational purposes through Bozeman Science Videos. In this Environmental Science video, entitled, Air Pollution, he explains in user friendly terms and in nine minutes how air pollution can affect our health in a negative way.

https://www.youtube.com/watch?v=_dTvtlct9k

Statement of Learning Objective:

Students will learn how scientists collect and use data on air quality and how the information can be used to improve the quality of life of a citizen.

Common Learner Misconceptions:

- Students may think that gases make things lighter and that air has no weight, color, or odor and is

in effect invisible and inconsequential. The correct concept: Gas (air) has mass, takes up space, and is affected by energy.

- Students may think that global warming is caused by the ozone hole, which was created by chemicals like hair spray. The correct concept: The ozone layer in the stratosphere protects the planet from the sun's harmful radiation. Holes in the ozone, caused by chemicals released by humans, let more harmful radiation from the sun reach the surface of Earth. This is not the same phenomenon as global warming.
- Source: <http://beyondpenguins.ehe.osu.edu/issue/climate-change-and-the-polar-regions/climate-misconceptions-a-top-10-list>

Materials:

- Digital camera and/or phone to take pictures on the field trip. Download the pictures when you return and use with your follow up lesson discussion.
- Science notebook for each student to record data
- Air Quality PowerPoint and student access to a computer or computer lab to collect data
- Construction paper in the following colors: green, yellow, orange, red, purple and maroon
- Cut construction paper into small strips, (for example: 2x2 or 4x4) each student will need one of each color. If you are unable to purchase construction paper or do not have it on hand in the needed colors, then have students use their crayons to color a strip of paper or 3 x 5 index card in the needed color, such as maroon.

Vocabulary:

- Environment
- Monitor
- Data collection
- Pollution
- Ozone
- Ground-level ozone
- Particle Pollution
- Chemicals
- Air Quality Index
- Environmental Protection Agency

Safety:

Students may have safety concerns about the air quality in his/her area after reading and learning about possible causes for air pollution. Assure students that the intent of the lesson is to learn ways to prevent air pollution and to be aware of possible dangers if the Air Quality Index is too high. It is not designed to keep children from playing outside. Just as we would not play outside in extreme temperatures or if there was a forest fire close by this could cause breathing problems. Common sense rules apply in all aspects of school.

The usual safety conditions apply in this lesson plan. Prior to the field trip, review the Conduct and Behavior Code of Conduct with your students for the INFINITY Science Center @ <http://www.visitinfinity.com/am-site/media/conducts-standards.pdf>

Safety Rules available for download from NSTA (National Science Teachers Association): <https://www.nsta.org/docs/SafetyInTheScienceClassroomLabAndField.pdf>

NSTA: Field Trip Safety
<http://www.nsta.org/docs/FieldTripSafety.pdf>

Adaptations/Accommodations for Exceptional Students:

English Language Learners may need help with understanding the vocabulary. Pair students with a

partner to help with directions and label the materials with the English word and also the student's native language when learning new material. Considering pairing students who may need additional help while researching the information in the computer lab or in the classroom. Follow any special guidelines needed for students with an IEP for Special Education.

Literacy Connections:

Additional Resources:

Air Quality Index (AQI) Toolkit for Teachers

https://airnow.gov/index.cfm?action=resources.aqi_toolkit

AIRNow – Enter your Zip Code to monitor the local air quality conditions

https://airnow.gov/index.cfm?action=airnow.local_city&zipcode=39572&submit=Go

Mississippi Department of Environmental Quality

<http://www.deq.state.ms.us/>

Learning and Teaching about the Environment

<https://www.epa.gov/students>

5E Instructional Process:

Engage:

Activity

1. Gather your students together and ask the following question, "What do scientists monitor in the environment?" "What does the word, *environment*, mean to you?" Write the questions on chart paper. Allow time for students to write down their thoughts to the question in their science notebook and then turn and talk to a classmate in their group about the question. (Environmental monitors collect data and about nature and produce records of what they observe over time.) After students have had time to write, and share their thoughts with a partner, record their ideas on chart paper. Keep the chart paper to add to or mark off ideas as you continue with the lesson.
2. Explain to your students that you are planning a class field trip to the INFINITY Science Center soon. While we are there we will learn how scientists collect data on different types of environments such as Ocean Conditions, Air Quality and River Conditions. Before we go to the INFINITY Science Center, we are going to learn why and how monitoring air quality is important to our daily lives.

Guiding Questions:

1. What do scientists monitor in the environment? What does the word, environment, mean to you?

Explore:

Activity:

1. Why is it important to study our local air quality? How safe is the air we breathe? Have you ever taken a deep breath outside and something made your nose itch, sneeze, and/or cough? Introduce the Air Quality PowerPoint with the beginning slide. Use the additional slides for informational purposes to help students develop content knowledge about ozone, air pollution, and how the Environmental Protection Agency or EPA monitors the air we breathe and assigns an Air Quality Index number.
2. Distribute the paper strips, or students may use crayons in the following colors to color strips of paper: green, yellow, orange, red, purple, and maroon. Introduce the Air Quality Index color code on slide 8. On slide 9, read and discuss the AQI for Ozone and what to do if the ozone level is too high. Point out to the students that generally, the ozone numbers may be too high on hot, dry days and we typically try to stay indoors or limit time outside, if the weather is too hot.
3. On the following slides, ask students to locate the state they live in and to hold up the AQI color

that is showing for most of the state on this particular day. For example, if we are looking at the city where the INFINITY Science Center is located, Pearlinton, Mississippi, then we see YELLOW, so students should hold up his/her yellow slip of paper. Ask, "What does the yellow area show us for the Air Quality Index?" (Yellow means there is a "moderate" risk. Some people, who are extra sensitive to pollution, might want to limit their time outside.)

4. Continue with the slide show and ask the students to look for patterns and cause and effect examples. For example, when they are viewing the slide with the AQI for San Bernardino, California, you should ask them why they think this area is considered Unhealthy for this particular date. Ask students to locate San Bernardino on the next slide and to look for a larger city in the nearby area. Los Angeles, California is located to the west of San Bernardino and this has been a problem area for smog for a number of years because of its location in a basin area. Over the years, improvements have been made to limit pollution.

Guiding Question:

1. Why is it important to study our local air quality?
2. How safe is the air we breathe?
3. Have you ever taken a deep breath outside and something made your nose itch, sneeze, and/or cough?

Explain:

Activity

1. Let's return to the beginning question, "What do scientists monitor in the environment?" We have learned and discussed how scientists collect data about air quality. Now it's your turn to collect data. Finish the lesson with the Air Quality PPT. Show and discuss slides 16-18, to help students as they use the AirNow website <https://www.airnow.gov/>. On this website they will locate other states on the map, record the data, and look for patterns and cause and effect relationships. For example, what time of the year are ozone levels typically higher? (High temperature days)
2. Students will collect Air Quality Index data on ten different states and at different times of the year. This activity may take more than one class period and will depend upon whether or not you have access to a computer lab or several computers at one time.
3. After students have collected the data, allow time for the students to share their information with classmates through a creative way of their choosing.

Guiding Questions

1. What do scientists monitor in the environment?
2. What time of the year are ozone levels typically higher?

Elaborate:

Activity

1. If time allows, students may be interested in applying for one of the EPA's Awards or entering a contest. The Gloria Barron Prize for Young Heroes honors students, ages 8 to 18 that have made a "significant positive impact on people, their communities, and the environment." The following link, <http://barronprize.org/apply/> will provide additional information for applicants. Other contests and awards can be found here: <https://www.epa.gov/students/student-awards-and-contests>

Evaluate:

Activity

1. Evaluate the student's data collection from the AIRNOW.GOV website. Could they locate 10 different states and identify the Air Quality Index color code for the suggested dates?
2. What can students do now as a result of learning about how scientists collect Air Quality data?
3. This lesson will help students to be able to interact and develop a greater awareness for the need

to collect data and be able to understand the information with the exhibits at the INFINITY Science Center.

Guiding Questions

1. Can students locate 10 different states and identify the Air Quality Index color code for the suggested dates?
2. Can students identify cause and effect relationships between and identify patterns and trends based on the time of the year the data was collected?