

QUICK REFERENCE

Air Quality Education + Climate Education



Interested in teaching about climate change and our changing environment but not sure where to start? Climate change concepts appears in several places in the North Carolina Department of Instruction standards depending on what grade you teach. It is important to note that climate change does not appear directly in the educational standards for students in elementary school. There are several standards that focus on observing weather, collating data, and making weather predictions based on those findings. Many of our partner teachers find that understanding combustion is a key concept if you want to dive deeper into this topic. Due to the nature of combustion and the concept of conservation of mass, burning fossil fuels adds carbon dioxide to the atmosphere. Fossil fuels are taken out of the ground and burned, which changes them from fuel and oxygen to carbon dioxide, water vapor, and possibly air pollution.

The N.C Department of Environmental Quality is dedicated to providing high quality educational resources and curricula to students, teachers, and educators in North Carolina to foster a more informed public and improve science literacy. Educational content provided by our agency is the result of research and analysis from scientists, but it is also informed by our partnerships with other scientific agencies, universities, educational groups, and a variety of stakeholders.

Below you will find information about key standards and links to activities to help you talk about air pollution and other climate-related topics with your students. N.C. DEQ envisions updating this and other educational pages in the future. If you have any questions, please email air.awareness@ncdenr.gov. You can also visit deq.nc.gov/NCairawareness and click on Teachers and Students, or contact the Office of Environmental Education at www.eenorthcarolina.org/about/contact-us if you need help getting started.

High School - Earth and Environmental Science

Key Standards

- EEn.2.6: Earth -- Analyze patterns of global climate change over time.
- EEn.2.6.1: Earth -- Differentiate between weather and climate.
www.climate.gov/teaching/resources/difference-between-weather-and-climate
- EEn.2.6.2: Earth -- Explain changes in global climate due to natural processes.
itsourair.org/1-2-combustion-combustion-equations
- EEn.2.6.3: Earth -- Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons, greenhouse effect, and deforestation).
- EEn.2.6.4: Earth -- Attribute changes to Earth's systems to global climate change (temperature change, changes in pH of the ocean, sea level changes, etc.).
- EEn.2.8.1: Earth -- Evaluate alternative energy technologies for use in North Carolina.
- 8.PCH.3.1: Health -- Outline the potential health consequences of global environmental problems.
- 8.PCH.3: Health -- Analyze measures necessary to protect the environment.
- 8.PCH.3.2: Health -- Explain the impact of personal behaviors on the environment, both positively and negatively.

Background Information & Activities

- You can find great background information in the *It's Our Air* lessons and activities located at www.itsourair.org. *It's Our Air Activity 3-2*, for example, is an introduction to Home Energy Solutions. This activity looks at how a home uses energy, and how different energy options can affect the air. It also utilizes this tool from the EPA: www.epa.gov/energy/greenhouse-gas-equivalencies-calculator. *It's Our Air Activity 3-3: Driving Choices and Calculating Car Emissions* is a great activity for new or future drivers and looks at transportation choices and air pollution.
- Due to the nature of combustion and conservation of mass, burning fossil fuels adds carbon dioxide to the atmosphere. Fossil fuels are taken out of the ground and burned, which changes them from fuel and oxygen to carbon dioxide, water vapor, and possibly air pollution. In the *It's Our Air Activity 1-2: Combustion and Combustion Equations* students use molecular models to better understand the effect of combustion on our air.

Seventh Grade

Key Standards

- 7.E.1: Science -- Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans.
- 7.E.1.1: Science -- Compare the composition, properties and structure of Earth's atmosphere to include mixtures of gases and differences in temperature and pressure within layers.
- 7.E.1.6: Science -- Conclude that the good health of humans requires monitoring the atmosphere, maintaining air quality and stewardship

Background Information & Activities

- Activity 1-1 from the *It's Our Air* curriculum provides educators with background knowledge that's important to understand before talking about air quality issues. The associated video can provide teachers and students with the foundation to understand the atmosphere.

www.itsourair.org/1-1-what-air

- Learn about combustion: Activity 1-2 from the *It's Our Air* curriculum can help teachers better understand the fundamentals of combustion and how it leads to greenhouse gas emissions and other air pollution problems. Due to the nature of combustion and conservation of mass, burning fossil fuels adds carbon dioxide to the atmosphere. Fossil fuels are taken out of the ground and burned, which changes them from fuel and oxygen to carbon dioxide, water vapor, and possibly, air pollution. A video introduces the concept of combustion as a chemical reaction.

itsourair.org/1-2-combustion-combustion-equations



Research in Action Projects

- **AQ- IQ Contest - Seventh Grade**

The North Carolina Division of Air Quality (DAQ) invites seventh grade students to learn about air and air pollution through the 2018 – 2019 AQ-IQ Contest. Students create a project that highlights an air quality issue and provides a solution to that issue. The projects can be a poster, artistic project, video or game, and the students can work in groups as large as four. The project puts the student in the role of presenting the information, which is one of the most effective ways to learn. The contest is correlated with the NC Department of Public Instruction Essential Standards in Science, Technology, and Social Studies.

deq.nc.gov/2018-2019AQIQContest

- **It's Our Air – Action Research project - High School**

High school students can participate in *It's Our Air Activity 3-5: Research and Action*. Working collaboratively, students will synthesize their knowledge of air quality and apply it to a research, stewardship, or education project. Students' interests and passions will guide the choice of projects, which can be carried out by the entire class or by small groups.

itsourair.org/3-5-research-and-action

- **The NC Green Schools Recognition Program**

The NC Green Schools Recognition Program recognizes North Carolina P-12 public and private schools that encourage cultures of sustainability. The NC Green Schools Rubric is an easy-to-follow guideline for earning recognition for the work you are doing at your school.

www.centerfortheenvironment.org/get-recognized.html

- **NC Green Power's Solar Schools**

NC GreenPower is pleased to announce Solar Schools, providing matching grants for 3-5 kW solar educational projects at schools, complete with a weather station, real-time monitoring, curriculum from NEED.org and training for teachers. Any K-12 school in North Carolina may apply for a 50% matching grant, up to \$10,000, and NC GreenPower will assist the school with raising the balance of funds required.

www.ncgreenpower.org/solar-schools/



Resources

- Why does carbon absorb heat anyway? Learn about Carbon dioxide absorbing heat: scied.ucar.edu/carbon-dioxide-absorbs-and-re-emits-infrared-radiation
- Several years ago, Robert Krulwich and National Public Radio produced a video series, *Global Warming: It's All About Carbon*. This series takes a humorous, but fact-based look at carbon, carbon dioxide, and how it is a part of our natural world. It's a bit dated, but fun to watch! *Global Warming: It's All About Carbon*:

On YouTube:

Episode One: www.youtube.com/watch?v=ypbb9Zi5Tao

Episode Two: www.youtube.com/watch?v=cOJ3MUpDrfl

Episode Three: www.youtube.com/watch?v=Q9u8vM8YjeU

Episode Four: www.youtube.com/watch?v=EvphJO8VKlc

Episode Five: www.youtube.com/watch?v=M0D5YHVMk8A