

IMPROVING KIDS' ENVIRONMENT



Smart Schools Don't Idle High School Lesson Plan¹

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Related Indiana Science Standards

<i>Content Area</i>	<i>Standard Identifier</i>	<i>Standard</i>
Biology – Ecology	B.1.37	Explain that the amount of life any environment can support is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organic materials. Recognize, therefore, that human activities and technology can change the flow and reduce the fertility of the land.
Biology – Ecology	B.1.41	Recognize that and describe how human beings are part of Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.
Biology – Ecology	B.1.43	Understand that and describe how organisms are influenced by a particular combination of living and nonliving components of the environment.
Biology – Ecology	B.1.45	Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of the way organisms develop within ecosystems.
Earth & Space – Earth	ES.1.18	Demonstrate the possible effects of atmospheric changes brought on by things such as acid rain, smoke, volcanic dust, greenhouse gases, and ozone depletion.
Animal Genetics and Environment	AS.4.21	Describe the impact humans have on the capacity of any system to support life. List the factors that limit the capacity of an ecosystem. Discuss the interactions that occur between birth rate, population growth, and carrying capacity of the ecosystem. Identify the demographic (birth, death, and fecundity rates) components that are used to construct a life history curve. Explain how demographic components are used in animal husbandry.
Evolutionary Trends and Ecology	PS.5	Students know that there are a variety of factors that contribute to the development and survival of plant species. Success of survival may depend upon breeding programs, environmental factors, and genes. Students also know that specific cycles, minerals, and other organisms may affect the success and survival of plants (as species, crop, or as an individual). Some plants have ways of protection or defense.

¹ Lesson plan materials drawn from U.S. EPA and Clean School Bus USA Idle-Reduction campaign. For more resources and classroom materials, see www.epa.gov/cleanschoolbus

First Day

Do Now:

- Define “idling.” Why do people idle in their cars? Do people idle at school? Is idling a problem at school? Why or why not?
- Discuss Do Now question as a class.

Engage:

- Engage students in Activity #1 or Activity #2 from below
- Probe student for reactions to activity
- Ask: What did we observe? (Pollution!) Does this change your mind about idling at school? Is it a problem? Why or why not?

Instruct:

- Ask: What is in air pollution? What are the gases, toxic and non-toxic, that are part of air pollution? How do these gases and particles affect the environment?
- Divide students into small groups (2 to 4)
- Pass out names of six different pollutants that are commonly found in car/bus exhaust
- Have each group answer questions concerning their gas/particle
- Have all students fill out their charts during brief presentations at the end of the class

Finish:

- Wrap-up class with discussion of harms of idling, speaking specifically of gases created by idling vehicles and the gases’ effect on humans and the environment

Second Day

Do Now:

- List six major gaseous air pollutants. Which gases are created by idling vehicles? What effects do the pollutant gases have on humans and the environment?
- Discuss Do Now question

Direct:

- Summarize yesterday’s conversation of idling – is it a problem? Why don’t people stop idling? Etc.
- Propose an outlandish rule that could solve idling around your school. Ask students for their reaction – would it work? Why not?
- Inform students that they will be proposing their own rule to limit/abolish idling on school grounds. They must explain how their rule will affect students, teachers, and the environment, defend their rule against criticism, and display a solid understanding of the potentially harmful effects, to humans and the environment, of idling
- Allow students to form small groups (2 to 4) and begin working on their rules
- At end of period (or beginning of following class), have each group present their rule, answering the questions above and defending their rule against other students’ criticisms and questions

Finish:

- Discuss previous two class periods as a class
- EITHER:
 - Option #1: Instruct each group to prepare a poster to display throughout school arguing for school to not allow idling

- Option #2: Through conversation allow students to guide next step(s) regarding their no idling policy. Perhaps they'll want to make posters to display in school (as above) or they'll want to petition the school administration or appeal to parents in a different form. Guide them to adopt a rigorous, practical, meaningful next step for no idling at your school.

Activity # 1: Comparative Sock Experiment

Materials Needed:

Two new, white tube socks, heavy rubber band, oven mitt, diesel bus.

Time: 20 minutes.

Activity: Before presentation, have one adult place one sock over the end of the tailpipe from a diesel vehicle. If needed, secure the sock with a heavy rubber band. Start the engine and idle it for at least five minutes. Remove the sock with an oven mitt, as the tailpipe will be hot. Turn the sock inside out to compare it with the clean sock and visibly see the accumulated particulate matter.

NOTE:

The Three Paper Experiment below was recommended by the EPA in its Clean School Bus Teacher's Toolkit. As provided by the EPA, the experiment offered no guidance for how long the papers need to be exposed to the air. Good luck, and please report back if you do the Three Paper Experiment!

If you still choose to do the Three Paper Experiment, it would likely be best to have students prepare the Three Paper Experiment activity (description below) **a week or two before you plan for today's lesson**. Having results for today's lesson will make the activity much more meaningful, showing students the differences among the quality of air in various school locations. If you do the experiment, please report back to us at Improving Kids' Environment to let us know how it went! Thanks.

Activity # 2: Three Paper Experiment*

Materials Needed:

Three pieces of heavy paper or index cards (with location and date marked on each piece), Vaseline, string or duct tape, and magnifying glasses.

Time: 20 -30 minutes

Activity: Collecting particulate matter from various areas around school campus will allow students to visibly analyze where and why accumulation is greatest. Prior to the experiment, have the class predict the outcomes.

Coat each paper with Vaseline. Hang one near the bus parking area, place the second in the school, and put the third paper in a drawer or closet. After a specified time, remove the papers and compare them with a magnifying glass.



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