Don't Be Idle—Take Action to Prevent Diesel School Bus Idling

INTRODUCTION

Twenty-five million students in the United States ride to and from school each day on a fleet of 600,000 diesel buses. Although school buses are among the safest forms of transportation, diesel exhaust emitted by the buses contains harmful gases and particles. In this lesson, students will learn about the health and environmental problems associated with bus idling and how they can work to change their school's idling policy.

LESSON OVERVIEW

Grade Level & Subject: Grades 7-12: Environmental Science, Health, Social Studies and Language Arts

Length: 45 minute lecture/discussion, two projects with length of your choice

Objectives:
After completing this lesson, students will be able to:

- Learn the health and environmental impacts caused by diesel exhaust and engine idling.
- Conduct an audit of the school's current idling practices.
- Write a policy proposal for improving the school's idling practices.
- Practice environmental stewardship by launching a No Idling Campaign for the school and community.

Standards:[1]

- **Content Standard: NL-ENG.K-12.5 COMMUNICATION STRATEGIES**
  - Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- **Content Standard: NL-ENG.K-12.7 EVALUATING DATA**
  - Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

[1] Education World (2008). *U.S. National Education Standards*. Retrieved March 6, 2008, from http://www.educationworld.com/standards/national/toc/index.shtml

- **Content Standard: NPH-H.9-12.7 HEALTH ADVOCACY**
  Students will demonstrate the ability to advocate for personal, family, and community health-
    - Evaluate the effectiveness of communication methods for accurately expressing health information and ideas.
    - Express information and opinions about health issues.
    - Utilize strategies to overcome barriers when communicating information, ideas, feelings, and opinions about health issues.
    - Demonstrate the ability to influence and support others in making positive health choices.
    - Demonstrate the ability to work cooperatively when advocating for healthy communities.
    - Demonstrate the ability to adapt health messages and communication techniques to the characteristics of a particular audience.
- **Content Standard: NS.9-12.1 SCIENCE AS INQUIRY**
  As a result of activities in grades 9-12, all students should develop
    - Abilities necessary to do scientific inquiry
    - Understandings about scientific inquiry
- **Content Standard: NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES**
  As a result of activities in grades 9-12, all students should develop understanding of
    - Personal and community health
    - Population growth
    - Natural resources
    - Environmental quality
    - Natural and human-induced hazards
    - Science and technology in local, national, and global challenges

Materials:

- Reproducible #1- **School Bus Idling Audit**
- Reproducible #2- **Idling Solutions**
- Three pieces of heavy paper
- Vaseline
- String or duct tape
- Magnifying glass
- Optional: Earth Day Network No Idling Campaign toolkits and resources (available at www.earthday.net/noidling)

Assessment:

Students will be assessed through the following activities:

- Participation in group and individual activity
- Completion of **Reproducible #1- School Bus Idling Audit**
- Individual written assignment

LESSON BACKGROUND

Vocabulary:

- **Idling:** Leaving the engine on while the vehicle is parked. This wastes gas and emits harmful emissions into the air through exhaust.
- **Diesel:** Fuel made from petroleum, which has better gas mileage and is used in larger vehicles and trucks.
- **Particulate Matter:** Mixture of extremely small particles and liquid droplets formed from harmful chemicals such as nitrates and sulfates. These can enter into a person's respiratory system and be harmful to their lungs, nose, and throat.

Information:

The U.S. Environmental Protection Agency has identified 40 chemicals in diesel exhaust that are classified as "hazardous air pollutants" under the Clean Air Act.[2] Along with these chemicals, diesel exhaust contains the pollutants sulfur oxide, nitrogen oxide, and carbon monoxide. Tiny particles of these pollutants, some you can see and some you cannot, enter the air when released from the exhaust pipe. These are known as particulate matter. They enter the air around and inside the bus and, if the bus is parked near an air-intake vent, can enter the school building. The particles can become lodged in the throat and lungs and exacerbate respiratory problems such as asthma and bronchitis.[3]

The health effects are especially severe for children. Children breathe 50 percent more air per pound than adults and are much more susceptible to diseases. (They are also smaller and therefore closer to the tailpipes than most adults.) Asthma is the most common chronic illness in children and is the leading cause of school absences.[4]

Along with negative health effects, school bus idling is also wasteful. Buses burn an average of half a gallon of fuel for each hour that they idle.[5] Especially when fuel prices are expensive, the waste from idling adds up. In addition to the cost of wasted gas, idling also wastes this finite fossil fuel, contributing to further price increases. Many drivers believe that running the engine at a low speed is necessary to warm up the vehicle and that idling is better for the engine. In fact, running the engine at a low speed wears it out twice as quickly as running at regular speed. A bus idling for one hour a day adds the equivalent of 1,260 miles of wear on the engine.[6] Most manufacturers recommend that vehicles do not need to be warmed up except in cold conditions (below freezing).[7] Furthering the economic costs, the exhaust from idling vehicles contributes unnecessarily to carbon in the

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[2] Airwatch Northwest (2006). *Idle Reduction Fact Sheet.* Retrieve March 6, 2008, from http://www.airwatchnorthwest.org/wa/NO_IDLE/Anti_Idle_FactSheet_long.html.
[3] Hamilton County Environmental Services Air Quality Management Division (2006). *School Bus Idling.* Retrieved March 6, 2008, from http://www.hcdoes.org/airquality/Anti-Idling/BusIdle.htm.
[4] Airwatch Northwest.
[5] Hamilton County Environmental Services.
[6] Airwatch Northwest.
[7] U.S. EPA.

atmosphere, a major contributor to global climate change.

Resources:

- Sample Policy Proposal: http://www.truman.gov/advice/advice_show.htm?doc_id=247326
- Earth Day Network's No Idling Campaign: http://www.earthday.net/noidling
- U.S. Environmental Protection Agency's Anti-Idling Campaign: http://epa.gov/cleanschoolbus/antiidling.htm

LESSON STEPS

Warm-up: *The Dangers of Diesel*

1. Begin by asking the class to raise their hand if they have ridden a school bus, even if only once. Ask them what stands out the most about buses. Is it the bumpy ride? The noise of the engine? What about the smell? Students will probably name the sight or smell of the exhaust fumes as a significant part of their bus ride.

2. Explain to the students that school buses and other large vehicles run on diesel fuel instead of gasoline. Diesel fuel is made from petroleum, like gasoline, but has better fuel mileage and is used for larger vehicles such as buses and trucks. Both gasoline and diesel vehicles expel the gases left over from the burning fuel as exhaust. Although exhaust from any vehicle is unhealthy, diesel exhaust in particular contains high volumes of pollution. Students have probably seen and smelled the black exhaust and smoke produced by school buses and other large vehicles.

3. Ask the students what the buses do while waiting for students to load or unload. Do they sit with their engines on for a while before leaving? Explain that this is called idling: running the engine at a low speed while the bus is parked or not in use. Idling causes diesel exhaust to build up around and inside of the bus and has harmful health effects.

Activity One: *Particulate Matter—Pollution You Can See*[8]

1. Coat three sheets of heavy paper with Vaseline. Hang one sheet outside near the bus parking area. Place another inside the school near the bus parking area, near a window, door, or an air-intake vent. Place the third in your hallway or classroom. Have the class predict which sheet will pick up the most particles.

2. After a designated period of time (2-5 days), remove the sheets and compare them to the students' predictions. Use the magnifying glass to better see the results. Lead a discussion with your students and ask questions such as:
    a) How does the sheet just inside the school compare with the sheet near the buses?
    b) Does a large volume of particulate matter make its way inside the building?

[8] Sierra Club (2003). *Air Quality and School Bus Idling*. Retrieved March 6, 2008, from http://northstar.sierraclub.org/campaigns/air/schoolbus/curriculum.pdf.

c) How much matter did the sheet in your classroom pick up?
d) What does this mean for the indoor air quality of your school?

Activity Two: *School Bus Idling Audit*

1. Now that you have seen the matter and pollution expelled by bus exhaust, use **Reproducible #1- School Bus Idling Audit**, to lead your class in an audit of your school's idling practices. Divide the class into groups and have each group conduct the survey. Students can find the information through observation, interviewing bus drivers, interviewing other students, and asking the school's principal or transportation director. You could split the class into groups and have each group use a different investigation method (observation, interview, research, etc.) and compare answers. (Also see the No Idling Teacher Toolkit at www.earthday.net/noidling for another example of an Idling Audit. Use these separately or complementarily.)

2. Once the groups finish the audit, combine the information they have found. There should be a good amount of overlap, but there should also be a few pieces individual groups picked up. Lead a brief discussion of what the class found and what implications their findings have for the school in terms of health, cost, and environmental impacts.

Activity Three: *Launch Your No Idling Campaign!*

1. Go to the website http://www.earthday.net/noidling for information on starting a No Idling Campaign at your school. The site includes toolkits with resources for students, teachers, parents, and administrators.

2. Using the information gathered from the No Idling Campaign toolkits and the school bus idling audits, have the class write a proposal for their school's idling policy. Have them create their own guidelines for bus and car idling reduction and benchmarks for the drivers and the school based on their own observations and the information in **Reproducible #2- Idling Solutions**. Remember that the proposal needs to be clear, detailed, and professional.

3. Get the word out! Your No Idling Campaign will be most effective if it includes the entire school and community. Here are a few suggestions for what your class can do:

    - Have students use the materials in the No Idling toolkit or have them create their own flyers or handouts to give to the rest of the school explaining what idling is, why it's a problem, and what they can do to help reduce it.
    - Have the class design "No Idling" posters to place in parking lots and bus waiting areas. Some sample slogans you can write are "Idle-Free Zone" and "Turn Off That Engine."
    - Have students pass out the idle reduction pledges from the No Idling toolkit to give to bus drivers and parents. The pledges can be general or they can specify when and for how long the drivers will turn off their engines. When they ask the drivers to sign, be sure they explain the benefits of reduced idling (to drivers' health as well!), and what your class is doing for their campaign.

- Hold an assembly or present to other classrooms what your class has learned about the effects of idling and your school's current idling policy. The more people you have supporting your campaign the more effective it will be.
- Organize a day to walk or bike to school. If the day is successful, expand it to a more regular time, such as once a month or once a week.
- Let your community know about the No Idling Campaign by writing to your local newspaper about your findings and your proposed policy.

4. Take your No Idling proposal to the principal, school board, PTA, or other organization with the authority to implement it. Let students make their case based on health and financial benefits of reduced idling, including clear and persuasive reasoning as to why the administration should focus on this issue. Provide research, data from the students' audits, and even a map showing the pollution's pathway into and through the school.

Extension: *Campaign Reflection*
If the campaign is successful, congratulations! If not, keep trying. Big changes don't come easily. For either outcome, have each student write a 2-3 page response paper about their experience. What have they learned about environmental and health advocacy and stewardship? Did they meet with any local leaders? How do they feel knowing that their actions directly made a change in their school and community?

CONCLUSION

At the end of this lesson, students should know about the financial costs as well as the health and environmental impacts of diesel buses and car idling. Students should be more conscious of their driving habits and be encouraged to reduce idling where they can. They should also gain practical skills in developing and launching an advocacy campaign in their school and community.

School Bus Idling Audit

On a separate sheet of paper, answer the following questions based on observations and interviews with school employees. This survey will help determine your school's current idling situation and will highlight areas that can be improved.

1. How many buses does the school use?

2. How long before school begins or lets out do the buses arrive?

3. Do the drivers idle the buses while they wait? If so, for how long?

4. Below, on the back, or on a separate sheet of paper, draw a map of the school, including the parking lot and drop-off/pick-up area.
    a. Be sure to indicate where the buses park. Is it close to the school building?
    b. Add the school's air-intake vents to the map. Are they close to the bus area? Could pollution from the buses enter the vents?
    c. Draw arrows to trace the possible path that air pollution from vehicle exhaust might take to reach your classroom.

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5. What formation do the buses park in? Are they parked end to end or parallel?

6. Do other large diesel vehicles such as delivery trucks come to your school? Do they leave their engines idling when they park?

7. What is the law concerning vehicle idling in your state?

8. Does your school have an idling policy? If so, what practices does it include? Do you feel the policy is sufficient?

9. Do a lot of students at your school have asthma? Do they ever feel as though the buses affect their ability to breathe properly?

Idling Solutions
(see www.earthday.net/noidling for more information)

Schools across the nation have begun to see the importance of reducing idling from buses and other diesel vehicles. Many schools go beyond their state's requirements and create their own idling policies for their campus. These environmentally conscious schools provide idle-reduction guidelines for bus drivers and parents who come to pick up their children. Effective guidelines for reducing bus idling include:[9]

- Limit warm-up time to 3-5 minutes, or as recommended by the manufacturer.
- Train bus drivers to turn off the engines during loading and unloading periods.
- Revise bus schedules to minimize waiting time.
- Provide a warm indoor space for bus drivers who arrive early to wait during the winter.
- Reduce bus "caravanning," following closely behind one another, as this causes exhaust from the first bus to enter the one after it.
- Recognize drivers who successfully reduce their idling with certificates, awards, or donated gifts from a school organization.

If they have the resources, schools also choose to improve the exhaust emissions of their buses. Some schools choose to replace their older buses with new, cleaner ones that have reduced fuel consumption and emissions. These buses run on compressed natural gas (CNG) or propane, gases that have much fewer harmful pollutants than diesel fuel. CNG vehicles release 80 percent less greenhouse gas emissions than gasoline and diesel engines,[10] and propane fuel emits 30-50 percent less greenhouse gases.[11]

Ways to reduce car idling:

- Carpool to reduce the number of vehicles on the road.
- Ban idling near school entrances where the exhaust can enter the building.
- Turn off the car if you will be stopped for more than 30 seconds.
- Wait to turn on your vehicle until traffic is clear.
- Organize a "walking school bus."

"Walking School Bus" or "Biking Train"

Instead of adding another vehicle to the road, why not walk or bike to school? Walking is free, fun, easy and healthy. Walking and biking promote healthy lifestyles for students who are increasingly at risk of becoming overweight.[12] More students are taking advantage of walking and

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[9] Hamilton County Environmental Services.
[10] California Energy Commission Consumer Energy Center (2006). *Compressed Natural Gas as a Transportation Fuel.* Retrieved March 17, 2008, from http://www.consumerenergycenter.org/transportation/afvs/cng.html.
[11] University of Colorado at Boulder (1999). *Propane.* Retrieved March 17, 2008, from http://lsa.colorado.edu/essence/texts/propane.htm.
[12] U.S. Dept. of Health and Human Services Center for Disease Control and Prevention (2008). *KidsWalk-to-School.* Retrieved March 17, 2008, from http://www.cdc.gov/nccdphp/dnpa/kidswalk/then_and_now.htm.

biking routes, which teaches them pedestrian safety and also creates a safer environment for them to walk in as the community adjusts to their presence.[13]

A walking school bus is simply a group of students from a neighborhood that walk to school together. Students, especially younger ones, should have at least one adult chaperone to ensure their safety. Walking school buses, or the alternative biking trains, can be informal or highly structured with timetables, checkpoints and a roster of volunteers.

The Chicago Public School System has instituted a very successful walking school bus program. As one of the largest urban districts in the U.S., 90 percent of their 422,000 public school children walk to school. Criminal and gang activity in the city threatened the safety of its students. In 1997 the city began Operation Safe Passage, building a network of over 3,000 volunteers who accompany students in citywide walking school buses. The Walking School Bus program ensures that students get to school and back safely and has the full support of the City of Chicago and the Chicago Police Department. The volunteers, or "drivers," wear special vests and the walking routes are patrolled by police officers.[14]

[13] National Center for Safe Routes to School (2007). *International Walk to School*. Retrieved March 17, 2008, from http://www.walktoschool.org/why/safety.cfm.
[14] Safe Routes to School (2001) *Promising Practices—From Whom Can We Learn?* Retrieved March 17, 2008, from http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2004/pages/section-4_chicago.htm.