

IN THE AIR

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Connecting Activity #2

"Belief Statement Two: Why Worry About Airborne Toxics? What You Don't Know Won't Hurt You"

9-12 EDUCATION MODULE



 MISSOURI
BOTANICAL
GARDEN

Correlation with Education Standards Summary

Connecting Activity #2

“Belief Statement Two: Why Worry About Airborne Toxics? What You Don’t Know Won’t Hurt You”

For a narrative description of these standards please refer to the Teacher’s Guide.

National Standards

SOURCE: www.education-world.com/standards

NPH-H.9-12

.1 .3 .4

NL-ENG.K-12

.3 .4 .6 .7 .8

NS.9-12.1 .3 .6

NCSS Strands VIII, IX, X

NT.K-12.2

Missouri Show-Me Standards

SOURCE: www.dese.mo.gov/standards

Performance Standards:

GOAL 1: 2, 4, 6, 7, 8, 10

GOAL 2: 1, 2, 3, 7

GOAL 3: 1, 4, 6, 7

GOAL 4: 1, 5, 7

Knowledge Standards:

CA 1, 3, 4, 5, 6

HPE 5, 6

SC 3, 4, 7, 8

SS 7

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IN THE AIR

Connecting Activity #2

“BELIEF STATEMENT TWO: WHY WORRY ABOUT AIRBORNE TOXICS? WHAT YOU DON’T KNOW WON’T HURT YOU”

OVERVIEW

Obviously, what you do not know CAN hurt you sometimes, so students analyze why many people prefer to block unpleasant information from their minds. One important reason (to be introduced by the teacher if students do not mention it) is that most people would rather not think about situations that overwhelm them or over which they have little or no control.

To counter such fears, large-scale air pollution problems (such as global warming and acid rain) are bypassed in this activity for air pollution problems more directly related to students’ lives and over which they have some control. One such problem is indoor air pollution at home, school, and work. Students are introduced to phytoremediation, the removal of certain indoor air toxics by common household plants.

Recommended Grade Level:

9-12

Preparation Time:

About 30 minutes will be needed to make copies of the worksheets (two separate pages) and to review the background information.

*Note: You need to distribute the “Media Warning Tally” sheet one week prior to the classroom activity. (see procedures #1)

Presentation Time:

One 45-50 minute class period

GOALS

- To encourage students to detect the nuances underlying attitudes toward air pollution problems
- To demonstrate the effectiveness of breaking large problems into smaller manageable segments
- To contrast indoor and outdoor pollution problems
- To suggest ways in which air quality problems may be reduced
- To introduce phytoremediation as one practical way of improving indoor air quality

OBJECTIVES

When this activity is completed, students will be able to do the following:

- Give three reasons why people block unpleasanties such as airborne toxics from their minds.
- Briefly discuss how breaking large problems into smaller ones is an effective research technique.
- State three reasons why indoor air problems can be worse than outdoor air problems.
- Define ambient air.
- Define phytoremediation, and explain how and why it works.

MATERIALS

Each Student will need:

- One copy of the Tell me Don't Tell Me Worksheet
- One copy of the Media Warnings Tally Sheet

VOCABULARY LIST

Indoor air pollutant:

Pollutants found inside buildings such as particles, dust, fibers, mists, molds, pollens, danders, and gases or vapors.

Phytoremediation:

Using certain types of plants to remove toxic wastes from air and soil.

Ambient or outdoor air:

Any unconfined portion of the atmosphere; open air, surrounding air (USEPA definition).

PROCEDURES

1. A week before beginning this activity, hand out copies of Media Warnings Tally Sheet and make the following assignment: "This week whenever you watch television, listen to the radio, read newspapers, magazines, billboards, or surf the Internet, make notes on this tally sheet about health and safety warnings directed at the reader/viewer."
2. Review indoor air quality information provided by the U.S. Environmental Protection Agency at <http://www.epa.gov/iaq/>. For publications and additional information about indoor air quality, see For Further Reading and Research.
3. Ask students if they have ever said or heard someone else say, "What you don't know won't hurt you?" Point out that the statement is not always true. For instance, if you step on a land mine, it will hurt you. Nevertheless, people still use the expression.
4. Hand out copies of Student Worksheet Tell Me/Don't Tell Me, and give students a few minutes to write down their responses to the questions. When they have finished, go over each question briefly, asking for comments. Discuss whether students noticed any patterns or logic to their replies.
5. Extract the following three patterns from their responses:
 - **"Overkill" Pattern:**
People are so overwhelmed by media reports about dangers to health, safety, and property that they no longer listen. Have students report the results from the media warnings assignment and discuss their feelings about what they observed. Be sure to end with the caveat that we should not turn a deaf ear to everything. We need to investigate warnings that raise real danger signals.
 - **"Personal Risk Assessment" Pattern:**
People focus their worries on their personal lives rather than on events that may never happen. Discussion: Why do millions of people continue to smoke when they know that tobacco is deadly? (*Ideas: Not everyone who smokes dies from it and certainly not immediately; nicotine is addictive; some people feel smoking has social/cultural aspects that outweigh the health risks.*)

- **“Mental Block” Pattern:**
Many people deal with unpleasant or potentially dangerous situations over which they have no control by blocking them out.
6. Discuss alternatives to dealing with serious airborne toxics problems rather than blocking them out. Conclude that one solution is to concentrate on a part of the problem over which we do have some control, for instance, indoor air pollution at school, home, and work.
 7. Point out that scientific comparisons between outdoor air and indoor air prove that indoor air is much more polluted than outdoor air. For more information on indoor air pollution research, see <http://www.arb.ca.gov/research/apr/past/indoor.htm>.
 8. Ask students to do the following:
 - a. Take out a sheet of paper and make three columns. Label them classroom, home, and workplace.
 - b. Jot down as many ideas as they can think of that could possibly make the air in those places more polluted than outside.
 - c. Discuss the responses after a few minutes. See guidelines for discussion in the chart below.

WHY IS INDOOR AIR MORE POLLUTED?		
CLASSROOM	HOME	WORKPLACE
<p>Type of room: Chemistry lab or art studio vs. regular classroom.</p> <p>Construction: Windows that do not open; asbestos in building materials; heating/cooling systems</p> <p>Furnishings: Formaldehyde fumes from laminated furniture and textiles, dust from chalk, fumes from markers.</p> <p>Natural pollutants: Mold, radon, dander, dust.</p> <p>People: Formaldehyde from wash and wear clothing; personal scents such as cologne, perfume, lotions; secondhand smoke if smoking is allowed anywhere in the building.</p>	<p>This will vary according to location, structure, and personal habits of residents but is generally the same as in the classroom with these additions:</p> <p>Chemicals: Cleaning and maintenance; paints; solvents</p> <p>Cooking: Fumes and smoke</p> <p>Fireplaces and wood stoves: Fumes and unburned particles</p> <p>Furnaces: Carbon monoxide leaks</p> <p>Vehicle fumes: Vehicles; riding lawnmowers</p> <p>Smoking: Cigarettes; pipes; cigars</p>	<p>Ask students to tell where they work and discuss the potential hazards they may be facing.</p> <p>Remind students that employers have a legal obligation to provide a safe workplace. If students are concerned about chemicals they use, tasks they perform, or negligent safety practices they observe, they should tell their supervisor. If that is not feasible, they should discuss it with a parent or another adult.</p>

9. Ask students to discuss ways of minimizing indoor air pollution. If no one mentions it, introduce the study of phytoremediation, removal of hazardous indoor air pollutants with certain species of plants. One of the pioneers in this field is Dr. B. C. Wolverton, an environmental engineer. Dr. Wolverton worked for the National Aeronautics and Space Administration (NASA) for thirty years developing closed ecological life support systems for future space travel and settlement. For more information about phytoremediation and Dr. Wolverton’s work, see For Further Reading And Research.

CONCLUSION

Shying away from troublesome topics that seem to have no solution is a common human reaction. However, a better way to deal with overwhelming problems is by breaking them into smaller pieces for some personal control. When we cannot avoid some pollutants, we can minimize their effects by understanding what we are dealing with, taking proper safety precautions, and making individual decisions to minimize the risks.

FOR FURTHER READING AND RESEARCH

General Information about Indoor Pollution

- <http://www.teriin.org/indoor/indoor.htm> Click on “Links.”
- Mother Earth News article: See “The Inside Scoop on Indoor Air” at http://www.findarticles.com/cf_0/m1279/1998_Dec/53263420/p1/article.jhtml?term=Indoor+air+pollution
- <http://www.epa.gov/iaq/>

Phytoremediation

- <http://www.mobot.org/jwccross/phytoremediation/>
- <http://www.clu-in.org/products/citguide/phyto2.htm>

U.S. Environmental Protection Agency Sources for Major Indoor Air Pollutants

- Asbestos <http://www.epa.gov/iaq/asbestos.html>.
- Biological pollutants: <http://www.epa.gov/iaq/biologic.html>.
- Carbon monoxide: <http://www.epa.gov/iaq/co.html>.
- Formaldehyde from pressed wood products: <http://www.epa.gov/iaq/formalde.html>.
- Household cleaning and maintenance chemicals; Personal care and hobby products: <http://www.epa.gov/iaq/voc.html>.
- Lead: <http://www.epa.gov/iaq/lead.html>.
- Nitrogen dioxide: <http://www.epa.gov/iaq/no2.htm>.
- Pesticides: <http://www.epa.gov/iaq/pesticid.html>.
- Radon: <http://www.epa.gov/iaq/radon/index.html>.
- Respirable particles from combustion sources: <http://www.epa.gov/iaq/rpart.html>.

EXTENSION IDEAS

- **An Internet Challenge:**
See Angry Red Planet at <http://www.accessexcellence.org/arp/>. Follow the instructions to troubleshoot a simulated space flight to Mars before the oxygen runs out in one of the experimental pods.
- **Phytoremediation Activity #1**
Using the sources below, students research the types of plants useful in removing hazardous airborne chemicals.
 1. NASA website: <http://www.zone10.com/wdocs/tech/NASA/fyh.htm>
 2. Dr. Wolverton’s website: <http://www.wolvertonenvironmental.com/>
 3. <http://www.ext.vt.edu/departments/envirohort/articles/misc/plntclar.html>
 4. Wolverton, B. C. How to Grow Fresh Air: 50 Household Plants that Purify Your Home or Office. New York: Penguin Books, 1997.

- **Phytoremediation Activity #2**

1. Ask a botanist or related professional to speak to the class about phytoremediation and how it works.
2. Arrange a field trip to a nursery or garden shop to identify plants that act as air purifiers.
3. If feasible, purchase one or two plants for your classroom or other area at your school. Print attractive descriptions of the plants to display with them. Explain how they work to clear the air of airborne toxics. An alternate suggestion is to present a plant to a local nursing home or hospital with information about its ability to improve air quality.

- **Phytoremediation Activity #3**

For a laboratory experiment demonstrating how plants remove carbon dioxide from an environment through photosynthesis, see

<http://www.blackgold.ab.ca/microtest/Science10Labs/photosynth.pfd>.



Media Warnings



DON'T

DANGER!!		RISK!!
WARNING		HAZARD



STOP

DATE	CATEGORY*	TOPIC**	MEDIA TYPE***	SOURCE****

*CATEGORY:	Health, safety, accident prevention, etc.
**TOPIC:	Specific subject such as medical issues, home safety, crime prevention, etc.
***MEDIA TYPE:	Television, radio, etc.
****SOURCE:	Commercials, public service message, news, special features, etc.

Tell Me / Don't Tell Me: A Dichotomy

Respond to each of the statements below according to whether you would want to know that particular piece of information; then give a brief reason for your response.

1. You have a small piece of spinach stuck on your front teeth.

_____ Tell me about it _____ Don't tell me about it

Why? _____

2. The city in which you live is not in compliance with legal clean air standards.

_____ Tell me about it _____ Don't tell me about it

Why? _____

3. The expensive jacket you bought last week is on sale this week for half the price.

_____ Tell me about it _____ Don't tell me about it

Why? _____

4. Four thousand people in Bhopal, India, were killed by a leak from a pesticide plant in 1986.

_____ Tell me about it _____ Don't tell me about it

Why? _____

5. Your furnace is leaking carbon monoxide.

_____ Tell me about it _____ Don't tell me about it

Why? _____

6. The hole in the earth's protective ozone layer over the Antarctic was smaller this year than last.

_____ Tell me about it _____ Don't tell me about it

Why? _____

7. Cigarette smoke contains over 40 compounds that are known to be toxic or carcinogenic.

_____ Tell me about it _____ Don't tell me about it

Why? _____

8. Seismologists say an earthquake is long overdue on the fault line that runs through your city.

_____ Tell me about it _____ Don't tell me about it

Why? _____

9. Your prom date asked two other people to the prom before he/she asked you.

_____ Tell me about it _____ Don't tell me about it

Why? _____

10. It is likely that a giant meteor will strike the earth someday.

_____ Tell me about it _____ Don't tell me about it

Why? _____

Do you see any pattern or logic to your answers? Discuss briefly on the back of the sheet.

