Understanding the Indoor Environment
Movement of Air
Mind Map Activity

The purpose of this lesson is foster an understanding of mechanical airflow.

TOPIC(S)			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY

OBJECTIVE(S)
The students will be able to describe mechanical airflow by creating a mind map of the ventilation process.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
Build your own background knowledge about ventilation using the Reference Guide (section 2, page 6) and IAQ Backgrounder (page 5) (see Resource section) from the EPA's *IAQ Tools for Schools* Action Kit. Ask the students questions about ventilation and have a class discussion. Indoor levels of pollutants may be two-five times (occasionally more than 100 times) higher than outdoor levels and we spend 90% of our time indoors. Ask students what they think happens to allow air to move in and out of their classroom. Review the definition and directions of mind mapping (or concept

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mapping) with the students. As the directions are explained, use chart paper to make an example of a mind map for the students using a simple concept that they have already mastered. Model the following mind mapping procedure:

1. Write down a central idea and generate new and related ideas which branch out from the center idea.
2. Turn the paper lengthwise (landscape). Use lines, arrows or some other symbols to show connections between the ideas generated on your mind map. Explain to the students that the process of developing the symbols and pictures to represent the key ideas on the mind map will help the brain remember. As the concepts on the mind map are developed by constructing meaning, the brain will be better able to recall the information.
3. Draw quickly on unlined paper without pausing, judging or editing. At this stage it is important not to eliminate any ideas (just as with typical brainstorming).
4. Labels can be added to the pictures to help explain key ideas or elaborate on one of the symbols. Leave lots of space so additions can be made to the mind map throughout the learning process.

Have the students create their own individual mind maps following the process you have modeled. After the mind maps are created have students share them with their peers by forming small groups and taking turns posting and explaining them (round robin style). Allow time for the students to dialogue and ask questions about the mind maps (such as why certain symbols were chosen). After sharing the mind maps in the small group, have the students select one person from each group to share their mind map with the whole class.

MATERIALS
chart paper, pencils, markers, highlighters, blank copy paper (one or two pieces per student)

GROUPING
whole class, small group, independent

ASSESSMENT
Teacher can observe and take anecdotal notes during the mind map creation and sharing stages. Teacher can collect the mind maps at the end of the lesson and evaluate each mind map for the student's understanding of airflow.

MODIFICATIONS/EXTENSIONS

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Students can create a class rubric to evaluate the mind maps. At the conclusion of a study on IAQ have the students create a mind map for each of the seven key topics area (listed on the chart at the beginning of this lesson plan). Have the students create the mind maps using only using pictures and symbols. Allow the students to use the mind maps at the end of the unit on a quiz or test. Publish a class book of the mind maps. Have the students use the mind maps to develop lessons to teach IAQ to other students. Go back to the mind map and add information about other key IAQ topics (when learned) such as sources of indoor air pollution. Invite a maintenance/HVAC technician or custodian to the classroom to talk to the students.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: 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
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators 6-8
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability

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Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit Reference Guide (section 2, page 6) and IAQ Backgrounder (page 5)