

*The purpose of this lesson is to introduce students to a unit of study on the topic of the indoor environment.*

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|---|--|---|--|---|--|
|   | <b>TOPIC(S)</b>                              | ✓ | COMPOSITION OF AIR   | ✓ | DEFINING THE INDOOR ENVIRONMENT                          |
| ✓ | EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS | ✓ | SOURCES OF INDOOR AIR POLLUTION                                | ✓ | MOVEMENT OF AIR<br>Natural and mechanical airflow (HVAC) |
| ✓ | IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS    | ✓ | SOLVING INDOOR ENVIRONMENT PROBLEMS<br>(Preventing and Fixing) | ✓ | VOCABULARY   |

### OBJECTIVE(S)

The students will be able to list questions, vocabulary and key ideas to learn during a unit of study about the indoor environment. Students will brainstorm concepts related to the indoor environment, define the concept of the indoor environment, and list properties of the indoor environment.

### 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

3-5, 6-12 science

### ESTIMATED TIME LENGTH

2-3 class periods

### LESSON PROCEDURES

#### **BACKGROUND**

What is Indoor Air Quality (IAQ)?

This lesson allows students to plan an investigation into this topic using a PowerPoint style **IAQ in Schools Comic Book** (see Materials section) that was created to foster student understanding. After reading and discussing the

comic book, the teacher will lead the students through the process of creating several graphic organizers to identify key ideas about the indoor environment.

What is a KWLH?

A KWLH is a teaching strategy that promotes active thinking and involvement during reading.

**K** - Stands for what we **KNOW** about the subject

**W** - Stands for what we **WANT** to learn

**L** - Stands for what we **LEARN** as we read

**H** - Stands for **HOW** we learned or plan to learn more (other sources might include the library, field trips, videos, Internet research)

### **PREPARATION**

Prior to the lesson, post three pieces of chart paper in the front of the class. Label one piece with the heading “vocabulary”, on one piece write the words “indoor environment” inside of a circle in the center of the page and on the last piece write the letters “KWLH” across the top of the page. Next, draw a line under the heading and lines going down to create a column under each letter (creating a KWLH chart).

### **VOCABULARY EXTRAPOLATION**

Point out the chart with the words indoor environment written on it. Ask the students what they think this phrase means. Ask the students what an environment is. After a brief dialogue tell the students they will be learning about IAQ and you will begin by reading them a comic book about the topic. Tell the students there will be some unfamiliar words in the comic book and the first thing they need to do is extrapolate the unfamiliar words. Ask the students what the word extrapolate means? Tell the students that they are going to work in small groups to identify words in the comic book they need to learn more in order to understand the story. Split the class into small groups. Give each student a copy of the comic book and a highlighter. Have the students independently look through the comic book and highlight words they cannot define. After they highlight the words, have the students share the words within their small group. Designate one student in each group as the recorder and provide that student with a small pad of sticky notes. Have the students share their words by going through the comic book page by page and telling each other which words they have highlighted. If someone in the group knows the meaning of another student’s word, then they can provide the definition during the group discussion. When there is a word that most of the group members have highlighted or that no one in the group can provide the definition for, have the recorder list that word on a sticky note and set it aside (one word per sticky). After the students complete the recording process, assign one student per group the task of reporting. As a whole class have the reporters take turns reporting their group’s words on the sticky notes. Each reporter will provide one of their group’s words per turn. If a word has already been mentioned by another

group, then it does not need to be stated again. Repeat the process continuing in the same order until each reporter has reported all of the identified words. You will write the words on the chart paper that you labeled “vocabulary” as they are reported. At the conclusion of the reporting, tell the students they will revisit the list after reading the comic book to see what definitions they have learned by hearing the words in context. Revisit the chart during the final phase of the lesson.

### ***KWLH CHART***

Tell the students before reading the comic book you are going to record the information that they know already about IAQ under the K column of the chart that you have placed in the front of the classroom. After recording what they know, tell the students you are now going to record all of the questions they can generate under the W column. After recording what they want to learn, begin reading the comic book to the class using the PowerPoint version. As you read the comic book continue to list the student’s additional questions under the W column. Tell the students that as you are reading to them, they may also be able to answer some of the questions. If this happens then list the answer under the L column beside the question. To record how the answer was learned, list “reading” under the H column next to the answer. After reading make a plan for the H column for all remaining questions.

### ***QUESTIONING (during reading)***

As you read the comic book ask the students questions to stimulate their thinking throughout the text. Ask students questions that encourage them to make predictions and set the purpose for reading. Listed below are some question stems to be used throughout the comic book.

- Page 2 – What do you think the other important environment is?
- Page 3 – How many hours of the day do you think we spend indoors?
- Page 5 – What do you think is in air?
- Page 7 – What word do we use to describe unclean air? Do you think that the air indoors can be polluted?
- Page 9 – What do we add to the indoor air that causes it to be unclean?
- Page 10 – What are some ways that a person’s health could be affected by the unclean air?
- Page 12 – How does air get into your school? (this question is already appears on page 12)
- Page 14 – If we were to around our classroom and school, what are some things that we would want to look for that could contribute to indoor air pollution?
- Page 24 – If we were to go outside and look around the building, what are some things we would want to look for that could affect the quality of our air inside our school?

### **INDOOR ENVIRONMENT CONCEPT WEB**

Refer students back to the chart with the words “indoor environment” in the circle in the center of the chart. Tell students they are going to come up with as many words, phrases, and key ideas related to the words “indoor environment” as they can (by doing so they will be able to develop a definition for the indoor environment). Tell students that creating this web will help review what they have learned about IAQ from reading the comic book. As the students tell you the words, phrases, and key ideas related to the indoor environment, list them by drawing a line out from the center circle and writing the word, phrase or key idea. Continue this process to form the concept web. After the web is complete, give each individual student a piece of paper. Ask students to use the web to help them write a definition of the indoor environment. The definition should be a few sentences long. Collect the definitions. Ask the whole class to look at the web. Ask the students to dialogue in small groups to see if they notice any categories which could be made by grouping some of the words, phrases, or key ideas together. When you label the categories students suggest, attempt to match the eight key topics of IAQ (listed at the top of this lesson plan). Use different colored markers to draw lines and arrows to identify the categories on the concept web. Put the main category headings in boxes so they can be easily recognized when looking at the chart.

### **PLANNING AN INVESTIGATION**

Using the concept web, KWLH charts, and vocabulary list, guide your students to plan a course of action for studying the indoor environment. The plan should address finding the answers to the remaining questions and defining the remaining vocabulary words. Guide their thinking in this process. You may choose to take their ideas and come up with the final course of study on your own. The students may elect to do independent research projects or divide into eight groups (each group may take one of the key topics listed above and develop a presentation for the class). Record the suggestions and put the plan in writing.

### **MATERIALS**

markers, chart paper, masking tape, sticky notes (one small pad per group), **IAQ in Schools Comic Book**—one copy per student (see IAQ Lesson 1 Supplement\_IAQ in Schools Comic Book.doc), writing paper, highlighters (one per student)

### **GROUPING**

whole class, small group, independent

### **ASSESSMENT**

Teacher can assess the student's written definitions of the indoor environment. Teacher can informally assess comprehension and communication skills during discussions.

### MODIFICATIONS/EXTENSIONS

Have students work in small cooperative learning groups to read the comic book and complete the KWHL chart and/or concept definition web. Have each small group study their assigned topic and then create and teach a lesson to the class. Have students work in partners to highlight the vocabulary words and/or write the definition of the indoor environment. At the conclusion of the lesson/unit have the students create their own comic book and/or redesign the illustrations in the comic book. Using available technology, have students turn the comic book into an animated short movie.

*Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:*

- *Share the comic book with the students and have a brief discussion*

### CURRICULUM CONNECTIONS

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

- 3: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- 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
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: 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
- 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 K-2
  - 8: Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
  - 9: Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, and drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
- Performance Indicators 3-5
  - 5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
  - 6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  - 7: Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
  - 8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
  - 9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
- Performance Indicators 6-8
  - 4: Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
  - 5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
  - 6: Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
  - 7: Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
  - 8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  - 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)
  - 5: Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)

- 6: Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
- 7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
- 8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
- 9: Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)
- 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  
Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

### RESOURCES

- **IAQ in Schools Comic Book**—provides an overview and introduction of the topic (see IAQ Lesson 1 Supplement\_IAQ in Schools Comic Book.doc)
- [EPA's IAQ Tools for Schools Action Kit](#) (3<sup>rd</sup> Edition), Reference Guide (section 2, page 4) and IAQ Backgrounder (page 5)