- **Grade Level**
  Upper Elementary, Middle School
- **Subject Areas**
  Environmental Science (Air Quality)
- **Duration**
  45 – 60 minutes
- **Setting**
  Classroom
- **Skills**
  gathering information, organizing, analyzing information, interpreting, role playing, group discussions, demonstrating to others
- **Vocabulary**
  Air pollution, particulate matter, fugitive dust, air quality, monitoring site, electron microscope, ozone, conflict resolution

CLEAN AIR MAKE MORE

Keep down the dust!

What can I do to help clean the air in Maricopa County?

Goals

Students will gain a greater awareness of air pollution issues. Individuals will be inspired to take action in their personal lives to reduce air pollution, and/or reduce their exposure to air pollution in general.

Description

Students learn about air pollution with a focus on Particulate Matter. They learn about the effects of particulate matter, and possible solutions to reduce air pollution. Students participate in role-play activity and discover different perspectives in a current, real-life situation regarding airborne dust in a residential neighborhood. Groups of students portray off-road vehicle riders, vacant landowner, neighbors, Air Quality Department field services inspector, and Maricopa County Sheriff Deputies, and try to resolve conflict between each group's needs.

Objectives

Students will:

- gain a greater awareness of air pollution issues.
- discover facts about particulate matter.
- be inspired to take action.
- attain a better understanding of multiple interest groups perspectives.
- learn conflict resolution.

Materials

Background information cards and extra paper copies on: off-road vehicle riders, landowner, neighbors, Maricopa County Air Quality Department and the Maricopa County Sheriff's Department.

Props are optional, can be substituted appropriately, and are greatly beneficial in adding excitement and interest in learning.
Setting up the scenario: cloth to represent area of desert land, Duplo blocks for homes, toy quad (off-road vehicle), toy bicycle, and toy child
Off-road vehicle users: helmet, gloves
Vacant landowner: hat, tie
Neighbors: watering can, trowel, garden gloves
Air quality inspectors: hat, clipboard, pen
Sheriff: sheriff's badge, caution tape

Visuals and demonstration
Air pollutant identification posters, particulate matter size comparison chart, unused and used filters from monitoring sites, electron microscope images of Particulate Matter 2.5, healthy/unhealthy pig's lungs comparison kit

Reference Materials

Literature:
Airborne Dust and Your Health
Air Quality and Your Health
Criteria pollutants chart ***Ozone***
26 Ways to Healthy Air
7 Ways You Can Be Air Smart
Car Care for Clean Air
The Clean Air Crew brochure

Use pre-assessment to measure prior knowledge for a base line to compare to post-assessment.

Activity Plan Introduction

Provide background information

- Facilitate discussion of air pollution in Maricopa County: identify major pollutants of concern (ozone, dust pollution) and their sources.
- Discuss health effects of air pollution utilizing healthy/unhealthy pig's lungs (for older students).

Open further discussion about Particulate Matter: what it is, utilizing size comparison chart, electron microscope images of fine particles, and filters.

Set up the scenario

- Spread out the cloth (an area of desert land in Maricopa County).
- Place blocks representing homes at the perimeter of three sides of the cloth. The area inside the residential border is a large plot of vacant land owned by a company located in Phoenix. Indicate that the fourth side borders Camelback Mountain Park (or other inaccessible land) that is fenced off to vehicles (although there is a break in the fence that riders squeeze through to ride on that land anyway).
- Place the toy quad and toy bicycle at different "homes," and then on the vacant land explaining that users of these vehicles ride on the vacant land without permission of the landowner. Discuss the difference in the amount of dust raised from a BMX bicycle versus a quad.

Assign roles

- Separate students into five groups. Assign roles to groups by handing each the appropriate props and background information cards and copies: off-road vehicle riders, landowners, neighbors, Maricopa County Air Quality Department, and Maricopa County Sheriff.

Facilitate discussion within separate groups

- Have one person from each group read the appropriate information card aloud to their group while others follow along on copies that came attached to the card.
- Roam from group to group encouraging discussion linked to their role's influence on airborne dust issues.
- Encourage groups to identify major points they would like to address to the group in their assumed perspective and try to find a reasonable solution to airborne dust issues. Have them write these ideas down on poster-size paper to share with the class.

Facilitate group discussion

- Taking turns, have each group discuss their perspective regarding off-road vehicle use of vacant land. Once each group has had the opportunity to present their points, open up the conversation to debate, making sure major points are discussed in pursuit of reasonable solutions.
- Summarize potential solutions and expand into actions the audience can use to reduce air pollution in general, and how to protect ourselves from air pollution.

Give post-assessment and compare with pre-assessment to measure knowledge gain.

Author

Pima County Department of Environmental Quality (May 2006)

Revised by

UA Maricopa County Cooperative Extension for the Maricopa County Air Quality Department (February 2012)

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Off-road Vehicle Users

- You ride on the vacant land near your home without permission of the landowner. The landowner has called the sheriffs' department lodging a trespassing complaint several times. A sheriff has come by once but you were not there.
- Discuss whether you should ride in this area and what impacts this has on the community. Should the landowner let you have access to this safe and very close location to ride your off-road vehicle?
- Discuss the difference in the amount of dust raised from a BMX bicycle versus a quad.
- Select someone to represent your groups' opinions.

Vacant Landowner

- Users of off-road vehicles ride on your vacant land without your permission. You have run them off yourself on numerous occasions.
- What steps do you take to deal with this issue? Who do you call?
- Discuss the difference in the amount of dust raised from a BMX bicycle versus a quad. Should you let bicycles use your property?
- Select someone to represent your groups' opinions.

Neighbors

- Members of your neighborhood ride off-road vehicles on the vacant land down the street from your house without permission of the landowner. They are noisy and make lots of dust!
- What steps should you take to deal with this issue?
- Discuss the difference in the amount of dust raised from a BMX bicycle versus a quad.
- Select someone to represent your groups' opinions.

Air Quality Inspectors

- Off-road vehicles in a Phoenix neighborhood ride on a large section of vacant land without permission of the landowner. It is creating a lot of noise and dust for the other community members
- What is your responsibility in this situation? Can you fine the off-road users?
- Discuss the difference in the amount of dust raised from a BMX bicycle versus a quad.
- Select someone to represent your groups' opinions.

Sheriff

- Off-road vehicles in Phoenix neighborhood ride on a large section of vacant land without permission of the landowner. It is creating a lot of noise and dust for the other community members.
- What is your responsibility in this situation? Can you ticket or even arrest the off-road riders?
- They're "nice" kids and really not hurting anyone! Should you just let them ride on the property since you are busy taking care of real crime?
- Select someone to represent your groups' opinions.

CLEAN AIR MAKE MORE

Keep down the dust!

Pre-assessment

1. Air pollution in Maricopa County is caused by:
    a. Dust
    b. Car exhaust
    c. ATV's
    d. All of the above

2. PM-10 is:
    a. A chemical to clean the air
    b. A carbon monoxide monitoring site
    c. An air quality regulation
    d. A dust particle size

3. Who enforces the air quality regulations in Maricopa County?
    a. Sherriff's Department
    b. ADEQ
    c. Arizona Game & Fish Department
    d. Maricopa County Air Quality Department

4. You can ride your bicycle or ATV anywhere you want as long as it is vacant land.
    a. True
    b. False

5. List some ways you can take action in your personal life to reduce air pollution:

    _____

    _____

    _____

    _____

    _____

    _____

    _____

    _____

CLEAN AIR MAKE MORE

Keep down the dust!

Post-assessment

1. Air pollution in Maricopa County is caused by:
    a. Dust
    b. Car exhaust
    c. ATV's
    d. All of the above

2. PM-10 is:
    a. A chemical to clean the air
    b. A carbon monoxide monitoring site
    c. An air quality regulation
    d. A dust particle size

3. Who enforces the air quality regulations in Maricopa County?
    a. Sherriff's Department
    b. ADEQ
    c. Arizona Game & Fish
    d. Maricopa County Air Quality Department Inspectors

4. You can ride your bicycle or ATV anywhere you want as long as it is vacant land.
    a. True
    b. False

5. List some ways you can take action in your personal life to reduce air pollution:

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

- **Grade Level**
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CLEAN AIR MAKE MORE

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Correlations to the Arizona Academic Standards

4th Grade

Writing, Grade 4, Strand 1, Concept 1
P.O. 1 -- Generate ideas through a variety of activities (e.g., brainstorming, graphic organizers, drawing, writer's notebook, group discussion, printed material
P.O. 2 -- Determine the purpose (e.g., to entertain, to inform, to communicate, to persuade) of a writing piece
P.O. 3 -- Determine the intended audience of a writing piece
P.O. 4 -- Use organizational strategies (e.g., graphic organizer, KWL chart, log) to plan writing
P.O. 5 -- Maintain a record (e.g., lists, pictures, journal, folder, notebook) of writing ideas

Writing, Grade 4, Strand 1, Concept 3
P.O. 5 -- Modify word choice appropriate to the application in order to enhance the writing
P.O. 7 -- Use resources and reference materials to select more precise vocabulary.

Writing, Grade 4, Strand 1, Concept 5
P.O. 1 -- Prepare writing in a format (e.g., oral presentation, manuscript, multimedia) appropriate to audience and purpose
P.O. 2 -- Share the writing with the intended audience
P.O. 4 -- Write legibly.

Writing, Grade 4, Strand 2, Concept 1
P.O. 1 -- Express ideas that are clear and directly related to the topic
P.O. 2 -- Provide content and selected details that are well-suited to audience and purpose
P.O. 3 -- Use relevant details to provide adequate support for the ideas.

Writing, Grade 4, Strand 2, Concept 3
P.O. 1 -- Show awareness of the audience through word choice and style
P.O. 2 -- Convey a sense of originality, sincerity, liveliness, or humor appropriate to topic and type of writing.

Writing, Grade 4, Strand 2, Concept 4
P.O. 1 -- Use a variety of specific and accurate words that effectively convey the intended message
P.O. 2 -- Use descriptive words and phrases that energize the writing
P.O. 3 -- Apply vocabulary and/or terminology appropriate to the type of writing

Writing, Grade 4, Strand 3, Concept 2
P.O. 1 -- Record information (e.g., observations, notes, lists, charts, map labels and legends) related to the topic
P.O. 2 -- Write an expository paragraph that contains: a. a topic sentence b. supporting details c. relevant information
P.O. 3 -- Write in a variety of expository forms (e.g., essay, summary, newspaper article, reflective paper, log, journal)

Reading, Grade 4, Strand 3, Concept 1
P.O. 1 -- Identify the main idea and supporting details in expository text
P.O. 2 -- Distinguish fact from opinion in expository text
P.O. 3 -- Determine author's main purpose (e.g., to inform, to describe, to explain) for writing the expository text
P.O. 4 -- Locate specific information by using organizational features (e.g., table of contents, headings, captions, bold print, glossaries, indices, italics, key words, topic sentences, concluding sentences) of expository text
P.O. 5 -- Identify appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, textbooks, CD-ROM, website) needed for a specific purpose
P.O. 6 -- Interpret information from graphic features (e.g., charts, maps, diagrams, illustrations, tables, timelines) in expository text
P.O. 7 -- Distinguish cause and effect
P.O. 8 -- Draw valid conclusions based on information gathered from expository text.

Reading, Grade 4, Strand 3, Concept 2
P.O. 1 -- Locate specific information from functional text (e.g., letters, memos, directories, menus, schedules, pamphlets, search engines, signs, manuals, instructions, recipes, labels, forms
P.O. 2 -- Interpret details from functional text for a specific purpose (e.g., to follow directions, to solve problems, to perform procedures, to answer questions.

Science, Grade 4, Strand 1, Concept 1
P.O. 1 -- Differentiate inferences from observations
P.O. 2 -- Formulate a relevant question through observations that can be tested by an investigation. (See M04-S2C1-01)
P.O. 3 -- Formulate predictions in the realm of science based on observed cause and effect relationships.
P.O. 4 -- Locate information (e.g., book, article, website) related to an investigation. (See W-E8-01).

Science, Grade 4, Strand 1, Concept 2
P.O. 1 -- Demonstrate safe behavior and appropriate procedures (e.g., use and care of technology, materials, organisms) in all science inquiry.
P.O. 2 -- Plan a simple investigation that identifies the variables to be controlled.
P.O. 3 -- Conduct controlled investigations (e.g., related to erosion, plant life cycles, weather, magnetism) in life, physical, and earth and space sciences.
P.O. 4 -- Measure using appropriate tools (e.g., ruler, scale, balance) and units of measure (i.e., metric, U.S. customary).(See M04-S4C4-03 and M04-S4C4-07)
P.O. 5 -- Record data in an organized and appropriate format (e.g., t-chart, table, list, written log).

Science, Grade 4, Strand 1, Concept 4
P.O. 1 -- Communicate verbally or in writing the results of an inquiry.(See W-E6-01)
P.O. 2 -- Choose an appropriate graphic representation for collected data: bar graph, line graph, Venn diagram, model. (see M04-S2C1-02)
P.O. 3 -- Communicate with other groups or individuals to compare the results of a common investigation.

Science, Grade 4, Strand 2, Concept 1
P.O. 2 -- Describe science-related career opportunities.

Science, Grade 4, Strand 3, Concept 1
P.O. 1 -- Describe how natural events and human activities have positive and negative impacts on environments (e.g., fire, floods, pollution, dams).
P.O. 2 -- Evaluate the consequences of environmental occurrences that happen either rapidly (e.g., fire, flood, tornado) or over a long period of time (e.g., drought, melting ice caps, the greenhouse effect, erosion).

Science, Grade 4, Strand 3, Concept 2
P.O. 1 -- Describe how science and technology (e.g., computers, air conditioning, medicine) have improved the lives of many people.
P.O. 2 -- Describe benefits (e.g., easy communications, rapid transportation) and risks (e.g., pollution, destruction of natural resources) related to the use of technology.
P.O. 3 -- Design and construct a technological solution to a common problem or need using common materials.

Math, Grade 4, Strand 4, Concept 4
P.O. 4 -- Approximate measurements to the appropriate degree of accuracy
P.O. 5 -- Compare units of measure to determine more or less relationships including: length - yards and miles, meters and kilometers, and weight - pounds and tons, grams and kilograms
P.O. 6 -- State equivalent relationships (e.g., 3 teaspoons = 1 tablespoon, 16 cups = 1 gallon, 2000 pounds = 1 ton).
P.O. 7 -- Compare the weight of two objects using both U.S. customary and metric units

5th Grade

Writing, Grade 5, Strand 1, Concept 1
P.O. 1 -- Generate ideas through a variety of activities (e.g., brainstorming, graphic organizers, drawing, writer's notebook, group discussion, printed material).
P.O. 2 -- Determine the purpose (e.g., to entertain, to inform, to communicate, to persuade) of a writing piece
P.O. 3 -- Determine the intended audience of a writing piece
P.O. 4 -- Use organizational strategies (e.g., graphic organizer, KWL chart, log) to plan writing
P.O. 5 -- Maintain a record (e.g., lists, pictures, journal, folder, notebook) of writing ideas
P.O. 6 -- Use time management strategies, when appropriate, to produce a writing product within a set time period.

Writing, Grade 5, Strand 1, Concept 5
P.O. 1 -- Prepare writing in a format (e.g., oral presentation, manuscript, multimedia) appropriate to audience and purpose
P.O. 2 -- Share the writing with the intended audience
P.O. 3 -- Use margins and spacing to enhance the final product
P.O. 4 -- Write legibly.

Writing, Grade 5, Strand 2, Concept 1
P.O. 1 -- Express ideas that are clear and directly related to the topic
P.O. 2 -- Provide content and selected details that are well-suited to audience and purpose
P.O. 3 -- Use relevant details to provide adequate support for the ideas

Writing, Grade 5, Strand 2, Concept 3
P.O. 1 -- Show awareness of the audience through word choice and style
P.O. 2 -- Convey a sense of originality, sincerity, liveliness, or humor appropriate to topic and mode
P.O. 3 -- Use language appropriate for topic and purpose

Writing, Grade 5, Strand 2, Concept 4
P.O. 1 -- Use a variety of specific and accurate words that effectively convey the intended message
P.O. 2 -- Use descriptive words and phrases that energize the writing
P.O. 3 -- Apply vocabulary and/or terminology appropriate to the type of writing
P.O. 4 -- Use literal and figurative language where appropriate to purpose. (See R05-S1C4-03, -04)

Writing, Grade 5, Strand 3, Concept 2
P.O. 1 -- Record information (e.g., observations, notes, lists, charts, map labels and legends) related to the topic
P.O. 2 -- Write an expository paragraph that contains:a topic sentence, supporting details, relevant information
P.O. 3 -- Write in a variety of expository forms (e.g., essay, summary, newspaper article, reflective paper, log, journal)

Writing, Grade 5, Strand 3, Concept 4
P.O. 1 -- Write persuasive text (e.g., advertisements, paragraphs) that attempts to influence the reader. (See R05-S3C3)

Writing, Grade 5, Strand 3, Concept 6
P.O. 1 -- Paraphrase information from a variety of sources (e.g., Internet, reference materials). (See R05-S3C1-04, -05, -06)
P.O. 2 -- Organize notes in a meaningful sequence. (See R05-S3C1-04, -05, -06)
P.O. 3 -- Write an informational report that includes main ideas and relevant details. (See R05-S3C1-04, -05, -06)

Reading, Grade 5, Strand 3, Concept 1
P.O. 1 -- Identify the main idea and supporting details in expository text
P.O. 2 -- Distinguish fact from opinion in expository text, using supporting evidence from text
P.O. 3 -- Determine author's main purpose (e.g., to inform, to describe, to explain) for writing the expository text
P.O. 4 -- Locate specific information by using organizational features (e.g., table of contents, headings, captions, bold print, glossaries, indices, italics, key words, topic sentences, concluding sentences) of expository text
P.O. 5 -- Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, textbooks, CD-ROM, website) for a specific purpose
P.O. 6 -- Interpret information from graphic features (e.g., charts, maps, diagrams, illustrations, tables, timelines) in expository text
P.O. 7 -- Identify cause and effect relationships (stated and implied
P.O. 8 -- Draw valid conclusions based on information gathered from expository text

Reading, Grade 5, Strand 3, Concept 2
P.O. 1 -- Locate specific information from functional text (e.g., letters, memos, directories, menus, schedules, pamphlets, search engines, signs, manuals, instructions, recipes, labels, forms
P.O. 2 -- Interpret details functional text for a specific purpose (e.g., to follow directions, to solve problems, to perform procedures, to answer questions)

Reading, Grade 5, Strand 3, Concept 3
P.O. 1 -- Determine an author's position regarding a particular idea, subject, concept, or object, using supporting evidence from the text
P.O. 2 -- Identify the intended effect of persuasive vocabulary (e.g., loaded/emotional words, exaggeration, euphemisms) that the author uses to influence readers' opinions
P.O. 3 -- Identify the intended effect of persuasive strategies (e.g., peer pressure, bandwagon, repetition) that the author uses to influence readers' perspectives

Science, Grade 5, Strand 1, Concept 1
P.O. 1 -- Formulate a relevant question through observations that can be tested by an investigation. (See M05-S2C1-01)
P.O. 2 -- Formulate predictions in the realm of science based on observed cause and effect relationships
P.O. 3 -- Locate information (e.g., book, article, website) related to an investigation. (See W-E8-01).

Science, Grade 5, Strand 1, Concept 4
P.O. 1 -- Communicate verbally or in writing the results of an inquiry. (See W-E6-01)
P.O. 2 -- Choose an appropriate graphic representation for collected data: bar graph, line graph, Venn diagram, model (See M05-S2C1-02)
P.O. 3 -- Communicate with other groups or individuals to compare the results of a common investigation.

Science, Grade 5, Strand 3, Concept 1
P.O. 1 -- Explain the impacts of natural hazards on habitats (e.g., global warming, floods, asteroid or large meteor impacts).
P.O. 2 -- Propose a solution, resource, or product that addresses a specific human, animal, or habitat need.
P.O. 3 -- Evaluate the possible strengths and weaknesses of a proposed solution to a specific problem relevant to human, animal, or habitat needs.

Science, Grade 5, Strand 3, Concept 2
P.O. 1 -- Describe the relationship between science and technology
P.O. 2 -- Explain how scientific knowledge, skills, and technological capabilities are integral to a variety of careers.
P.O. 3 -- Design and construct a technological solution to a common problem or need using common.

Science, Grade 5, Strand 5, Concept 1
P.O. 1 -- Identify that matter is made of smaller units called: molecules (e.g., H2O, CO2), atoms (e.g., H, N, Na)
P.O. 2 -- Distinguish between mixtures and compounds.
P.O. 3 -- Describe changes of matter: physical – cutting wood, ripping paper, freezing water; chemical – burning of wood, rusting of iron, milk turning sour.

Science, Grade 5, Strand 5, Concept 2
P.O. 1 -- Describe the following forces: gravity, friction.
P.O. 2 -- Describe the various effects forces can have on an object (e.g., cause motion, halt motion, change direction of motion, cause deformation).
P.O. 3 -- Examine forces and motion through investigations using simple machines (e.g., wedge, plane, wheel and axle, pulley, lever).
P.O. 4 -- Demonstrate effects of variables on an object's motion (e.g., incline angle, friction, applied forces).

6th Grade

Writing, Grade 6, Strand 1, Concept 1
P.O. 1 -- Generate ideas through a variety of activities (e.g., prior knowledge, discussion with others, printed material or other sources).
P.O. 2 -- Determine the purpose (e.g., to entertain, to inform, to communicate, to persuade, to explain) of an intended writing piece
P.O. 3 -- Determine the intended audience of a writing piece
P.O. 4 -- Establish a central idea appropriate to the type of writing
P.O. 5 -- Use organizational strategies (e.g., outline, chart, table, graph, Venn Diagram, web, story map, plot pyramid) to plan writing
P.O. 6 -- Maintain a record (e.g., lists, journal, folder, notebook) of writing ideas.
P.O. 7 -- Use time management strategies, when appropriate, to produce a writing product within a set time period.

Writing, Grade 6, Strand 1, Concept 2
P.O. 1 -- Use a prewriting plan to develop a draft with main idea(s) and supporting details
P.O. 2 -- Organize writing into a logical sequence that is clear to the audience.

Writing, Grade 6, Strand 1, Concept 5
P.O. 1 -- Prepare writing in a format (e.g., oral presentation, manuscript, multimedia) appropriate to audience and purpose
P.O. 2 -- Use margins and spacing to enhance the final product
P.O. 3 -- Use graphics (e.g., drawings, charts, graphs), when applicable, to enhance the final product
P.O. 4 -- Write legibly.

Writing, Grade 6, Strand 2, Concept 1
P.O. 1 -- Use clear, focused ideas and details to support the topic
P.O. 2 -- Provide content and selected details that are well suited to audience and purpose
P.O. 3 -- Develop a sufficient explanation or exploration of the topic
P.O. 4 -- Include ideas and details that show original perspective.

Writing, Grade 6, Strand 2, Concept 3
P.O. 1 -- Show awareness of the audience through word choice and style
P.O. 2 -- Convey a sense of identity through originality, sincerity, liveliness, or humor appropriate to the topic and type of writing
P.O. 3 -- Use language appropriate for the topic and purpose
P.O. 4 -- Choose appropriate voice (e.g., formal, informal) for the audience and purpose.

Writing, Grade 6, Strand 3, Concept 2
P.O. 1 -- Record information (e.g., observations, notes, lists, charts, map labels and legends) related to the topic
P.O. 2 -- Write a summary based on the information gathered that include(s): a topic sentence, supporting details, relevant information (See R06-S3C1-02)
P.O. 3 -- Write a process essay that includes: a thesis statement, supporting details, introductory, body, and concluding paragraphs.

Writing, Grade 6, Strand 3, Concept 4
P.O. 1 -- Write persuasive text (e.g., essay, paragraph, written communications) that: establishes and develops a controlling idea, supports arguments with detailed evidence, includes persuasive techniques, excludes irrelevant information.

Reading, Grade 6, Strand 3, Concept 1
P.O. 1 -- Restate the main idea (explicit or implicit) and supporting details in expository text
P.O. 2 -- Summarize the main idea and critical details of expository text, maintaining chronological or logical order
P.O. 3 -- Distinguish fact from opinion in expository text, providing supporting evidence from text
P.O. 4 -- Identify the author's stated or implied purpose(s) for writing expository text
P.O. 5 -- Locate specific information by using organizational features (e.g., table of contents, headings, captions, bold print, italics, glossaries, indices, key/guide words, topic sentences, concluding sentences) of expository text.
P.O. 6 -- Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, CD-ROM, website) for a specific purpose
P.O. 7 -- Interpret graphic features (e.g., charts, maps, diagrams, illustrations, tables, timelines, graphs) of expository text
P.O. 8 -- Identify the organizational structures (e.g., chronological order, comparison and contrast, cause and effect relationships, logical order) of expository text
P.O. 9 -- Draw valid conclusions about expository text, supported by text evidence.

Reading, Grade 6, Strand 3, Concept 2
P.O. 1 -- Use information from text and text features to determine the sequence of activities needed to carry out a procedure
P.O. 2 -- Identify the text features (e.g., directions, legend, illustrations, diagram, sequence, bold face print, headings) of functional text
P.O. 3 -- Interpret details from functional text for a specific purpose (e.g., to follow directions, to solve a problem, to perform a procedure, to answer questions).

Reading, Grade 6, Strand 3, Concept 3
P.O. 1 -- Determine the author's specific purpose for writing the persuasive text
P.O. 2 -- Identify the facts and details that support the author’s argument regarding a particular idea, subject, concept, or object
P.O. 3 -- Describe the intended effect of persuasive strategies and propaganda techniques (e.g., bandwagon, peer pressure, repetition, testimonial, transfer, loaded words) that an author uses.

Science, Grade 6, Strand 2, Concept 1
P.O. 4 -- Describe the use of technology in science-related careers.

Science, Grade 6, Strand 3, Concept 1
P.O. 1 -- Evaluate the effects of the following natural hazards: sandstorm, hurricane, tornado, ultraviolet light, lightning-caused fire.
P.O. 2 -- Describe how people plan for, and respond to, the following natural disasters: drought, flooding, tornadoes.

Science, Grade 6, Strand 3, Concept 2
P.O. 1 -- Propose viable methods of responding to an identified need or problem.
P.O. 2 -- Compare possible solutions to best address an identified need or problem.
P.O. 3 -- Design and construct a solution to an identified need or problem using simple classroom materials.
P.O. 4 -- Describe a technological discovery that influences science.

7th Grade

Writing, Grade 7, Strand 1, Concept 1
P.O. 1 -- Generate ideas through a variety of activities (e.g., prior knowledge, discussion with others, printed material or other sources
P.O. 2 -- Determine the purpose (e.g., to entertain, to inform, to communicate, to persuade, to explain) of an intended writing piece
P.O. 3 -- Determine the intended audience of a writing piece
P.O. 4 -- Establish a central idea appropriate to the type of writing
P.O. 5 -- Use organizational strategies (e.g., outlines, charts, tables, graphs, Venn Diagrams, webs, story map, plot pyramid) to plan writing
P.O. 6 -- Maintain a record (e.g., lists, journals, folders, notebooks) of writing ideas
P.O. 7 -- Use time management strategies, when appropriate, to produce a writing product within a set time period.

Writing, Grade 7, Strand 1, Concept 5
P.O. 1 -- Prepare writing in a format (e.g., oral presentation, manuscript, multimedia) appropriate to audience and purpose
P.O. 2 -- Use margins and spacing to enhance the final product
P.O. 3 -- Use graphics (e.g., drawings, charts, graphs), when applicable, to enhance the final product
P.O. 4 – Write legibly.

Writing, Grade 7, Strand 2, Concept 1
P.O. 1 -- Use clear, focused ideas and details to support the topic
P.O. 2 -- Provide content and selected details that are well-suited to audience and purpose
P.O. 3 -- Develop a sufficient explanation or exploration of the topic
P.O. 4 -- Include ideas and details that show original perspective.

Writing, Grade 7, Strand 2, Concept 3
P.O. 1 -- Show awareness of the audience through word choice, style, and an appropriate connection with, or distance from, the audience
P.O. 2 -- Convey a sense of identity through originality, sincerity, liveliness, or humor appropriate to the topic and type of writing
P.O. 3 -- Use language appropriate for the topic and purpose
P.O. 4 -- Choose appropriate voice (e.g., formal, informal, academic discourse) for the audience and purpose.

Writing, Grade 7, Strand 3, Concept 2
P.O. 1 -- Record information (e.g., observations, notes, lists, charts, map labels and legends) related to the topic
P.O. 2 -- Write a summary based on the information gathered that include(s): a topic sentence, supporting details, relevant information. (See R07-S3C1-02)
P.O. 3 -- Write a process essay that includes: a thesis statement, supporting details, introductory, body, and concluding paragraphs.

Writing, Grade 7, Strand 3, Concept 4
P.O. 1 -- Write persuasive text (e.g., essay, paragraph, written communications) that: establishes and develops a controlling idea, supports arguments with detailed evidence, includes persuasive techniques, excludes irrelevant information, attributes sources of information when appropriate (See R07-S3C3).

Writing, Grade 7, Strand 3, Concept 6
P.O. 1 -- Write a summary of information from sources (e.g. encyclopedias, websites, experts) that includes: paraphrasing to convey ideas and details from the source, main idea(s) and relevant details. (See R07-S3C1-05, -06, -07, -08)
P.O. 2 -- Write an informational report that includes: a focused topic, appropriate facts and relevant details, a logical sequence, a concluding statement, a list of sources used. (See R07-S3C1-05, -06, -07, -08)

Reading, Grade 7, Strand 3, Concept 1
P.O. 1 -- Restate the main idea (explicit or implicit) and supporting details in expository text
P.O. 2 -- Summarize the main idea (stated or implied) and critical details of expository text, maintaining chronological, sequential, or logical order
P.O. 3 -- Distinguish fact from opinion in expository text, providing supporting evidence from text
P.O. 4 -- Identify the author's stated or implied purpose(s) for writing expository text
P.O. 5 -- Locate specific information by using organizational features (e.g., table of contents, headings, captions, bold print, italics, glossaries, indices, key/guide words, topic sentences, concluding sentences, end notes, footnotes, bibliographic references) in expository text
P.O. 6 -- Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, CD-ROM, website) for a specific purpose
P.O. 7 -- Differentiate between primary and secondary source material
P.O. 8 -- Interpret graphic features (e.g., charts, maps, diagrams, illustrations, tables, timelines, graphs) of expository text
P.O. 9 -- Apply knowledge of organizational structures (e.g., chronological order, comparison and contrast, cause and effect relationships, logical order) of expository text to aid comprehension
P.O. 10 -- Make relevant inferences about expository text, supported by text evidence
P.O. 11 -- Compare (and contrast) the central ideas and concepts from selected readings on a specific topic.
P.O. 12 -- Explain how authors use elements (e.g., language choice, organization) of expository text to achieve their purposes.

Science, Grade 7, Strand 1, Concept 1
P.O. 1 -- Formulate questions based on observations that lead to the development of a hypothesis. (See M07-S2C1-01)
P.O. 2 -- Select appropriate resources for background information related to a question, for use in the design of a controlled investigation. (See W-E8-01)
P.O. 3 -- Explain the role of a hypothesis in a scientific inquiry.

Science, Grade 7, Strand 1, Concept 3
P.O. 1 -- Analyze data obtained in a scientific investigation to identify trends. (See M07-S2C1-08)
P.O. 2 -- Form a logical argument about a correlation between variables or sequence of events (e.g., construct a cause-and-effect chain that explains a sequence of events).
P.O. 3 -- Analyze results of data collection in order to accept or reject the hypothesis.
P.O. 4 -- Determine validity and reliability of results of an investigation.
P.O. 5 -- Formulate a conclusion based on data analysis.
P.O. 6 -- Refine hypotheses based on results from investigations.
P.O. 7 -- Formulate new questions based on the results of a previous investigation.

Science, Grade 7, Strand 1, Concept 4
P.O. 1 -- Choose an appropriate graphic representation for collected data: line graph, double bar graph, stem and leaf plot, histogram. (See M07-S2C1-03)
P.O. 2 -- Display data collected from a controlled investigation. (See M07-S2C1-03)
P.O. 3 -- Communicate the results of an investigation with appropriate use of qualitative and quantitative information. (See W-E6-PO1)
P.O. 4 -- Write clear, step-by-step instructions for following procedures (without the use of personal pronouns).

Science, Grade 7, Strand 2, Concept 1
P.O. 4 -- Analyze the use of technology in science-related careers.

Science, Grade 7, Strand 2, Concept 2
P.O. 1 -- Describe how science is an ongoing process that changes in response to new information and discoveries.
P.O. 2 -- Describe how scientific knowledge is subject to change as new information and/or technology challenges prevailing theories.
P.O. 3 -- Apply the following scientific processes to other problem solving or decision making situations: observing, questioning, communicating, comparing, measuring, classifying, predicting, organizing data, inferring, generating hypotheses, identifying variables.

Science, Grade 7, Strand 3, Concept 1
P.O. 1 -- Analyze environmental risks (e.g., pollution, destruction of habitat) caused by human interaction with biological or geological systems.
P.O. 2 -- Analyze environmental benefits of the following human interactions with biological or geological systems: reforestation, habitat restoration, construction of dams
P.O. 3 -- Propose possible solutions to address the environmental risks in biological or geological systems.

Science, Grade 7, Strand 3, Concept 2

P.O. 1 -- Propose viable methods of responding to an identified need or problem.
P.O. 2 -- Compare solutions to best address an identified need or problem.
P.O. 3 -- Design and construct a solution to an identified need or problem using simple classroom materials.
P.O. 4 -- Describe a scientific discovery that influences technology.

8th Grade

Writing, Grade 8, Strand 1, Concept 1

P.O. 1 -- Generate ideas through a variety of activities (e.g., prior knowledge, discussion with others, printed material or other sources
P.O. 2 -- Determine the purpose (e.g., to entertain, to inform, to communicate, to persuade, to explain) of an intended writing piece
P.O. 3 -- Determine the intended audience of a writing piece
P.O. 4 -- Establish a central idea appropriate to the type of writing
P.O. 5 -- Use organizational strategies (e.g., outlines, charts, tables, graphs, Venn Diagrams, webs, story map, plot pyramid) to plan writing
P.O. 6 -- Maintain a record (e.g., lists, journals, folders, notebooks) of writing ideas
P.O. 7 -- Use time management strategies, when appropriate, to produce a writing product within a set time period.

Writing, Grade 8, Strand 1, Concept 5

P.O. 1 -- Prepare writing in a format (e.g., oral presentation, manuscript, multimedia) appropriate to audience and purpos
P.O. 2 -- Use margins and spacing to enhance the final product
P.O. 3 -- Use graphics (e.g., drawings, charts, graphs), when applicable, to enhance the final product
P.O. 4 -- Write legibly.

Writing, Grade 8, Strand 2, Concept 1

P.O. 1 -- Use clear, focused ideas and details to support the topic
P.O. 2 -- Provide content and selected details that are well-suited to audience and purpose
P.O. 3 -- Develop a sufficient explanation or exploration of the topic
P.O. 4 -- Include ideas and details that show original perspective

Writing, Grade 8, Strand 3, Concept 2

P.O. 1 -- Record information (e.g., observations, notes, lists, charts, map labels and legends) related to the topic
P.O. 2 -- Write a summary based on the information gathered that include(s): a topic sentence, supporting details, relevant information (See R08-S3C1-02)
P.O. 3 -- Write an explanatory essay that includes: a thesis statement, supporting details, introductory, body, and concluding paragraphs.

Writing, Grade 8, Strand 3, Concept 4

P.O. 1 -- Write persuasive text (e.g., essay, paragraph, written communications) that: establishes and develops a controlling idea, supports arguments with detailed evidence, includes persuasive techniques, excludes irrelevant information, attributes sources of information when appropriate.

Writing, Grade 8, Strand 3, Concept 6

P.O. 1 -- Write a summary of information from sources (e.g. encyclopedias, websites, experts) that includes: paraphrasing to convey ideas and details from the source, main idea(s) and relevant details. (See R08-S3C1-05, -06, -07, -08)
P.O. 2 -- Write an informational report that includes: a focused topic, appropriate facts and relevant details, a logical sequence, a concluding statement, a list of sources used.

Reading, Grade 8, Strand 3, Concept 1

P.O. 1 -- Restate the main idea (explicit or implicit) and supporting details in expository text
P.O. 2 -- Summarize the main idea (stated or implied) and critical details of expository text, maintaining chronological, sequential, or logical order

P.O. 3 -- Distinguish fact from opinion in expository text, providing supporting evidence from text
P.O. 4 -- Identify the author's stated or implied purpose(s) for writing expository text
P.O. 5 -- Locate specific information by using organizational features (e.g., table of contents, headings, captions, bold print, italics, glossaries, indices, key/guide words, topic sentences, concluding sentences, end notes, footnotes, bibliographic references) in expository text
P.O. 6 -- Locate appropriate print and electronic reference sources (e.g., encyclopedia, atlas, almanac, dictionary, thesaurus, periodical, CD-ROM, website) for a specific purpose
P.O. 7 -- Differentiate between primary and secondary source materials
P.O. 8 -- Interpret graphic features (e.g., charts, maps, diagrams, illustrations, tables, timelines, graphs) of expository text.
P.O. 9 -- Apply knowledge of organizational structures (e.g., chronological order, comparison and contrast, cause and effect relationships, logical order, classification schemes) of expository text to aid comprehension
P.O. 10 -- Make relevant inferences about expository text, supported by text evidence
P.O. 11 -- Compare (and contrast) the central ideas and concepts from selected readings on a specific topic
P.O. 12 -- Explain how authors use elements (e.g., language choice, organization) of expository text to achieve their purposes.

Reading, Grade 8, Strand 3, Concept 2
P.O. 1 -- Use information from text and text features to determine the sequence of activities needed to carry out a procedure
P.O. 2 -- Determine what information (e.g., steps in directions, legend, supplies needed, illustrations, diagram, sequence) is extraneous in functional text
P.O. 3 -- Interpret details from a variety of functional text (e.g., warranties, product information, technical manuals, instructional manuals, consumer safety publications) for a specific purpose (e.g., to follow directions, to solve problems, to perform procedures, to answer questions
P.O. 4 -- Evaluate the adequacy of details and facts from functional text to achieve a specific purpose.

Reading, Grade 8, Strand 3, Concept 3
P.O. 1 -- Determine the author's specific purpose for writing the persuasive text
P.O. 2 -- Evaluate the effectiveness of the facts used to support an author’s argument regarding a particular idea, subject, concept, or object
P.O. 3 -- Describe the intended effect of persuasive strategies and propaganda techniques (e.g., bandwagon, peer pressure, repetition, testimonial, transfer, loaded words) that an author uses
P.O. 4 -- Identify specific instances of bias in persuasive text.

Science, Grade 8, Strand 1, Concept 1
P.O. 1 -- Formulate questions based on observations that lead to the development of a hypothesis. (See M08-S2C1-01)
P.O. 2 -- Use appropriate research information, not limited to a single source, to use in the development of a testable hypothesis. (See R08-S3C2-03 and W-E8-01)
P.O. 3 -- Generate a hypothesis that can be tested.

Science, Grade 8, Strand 1, Concept 3
P.O. 1 -- Analyze data obtained in a scientific investigation to identify trends. (See M08-S2C1-08)
P.O. 2 -- Form a logical argument about a correlation between variables or sequence of events (e.g., construct a cause-and-effect chain that eXplains a sequence of events).
P.O. 3 -- Interpret data that show a variety of possible relationships between two variables, including: positive relationship, negative relationship, no relationship
P.O. 4 -- Formulate a future investigation based on the data collected.
P.O. 5 -- EXplain how evidence supports the validity and reliability of a conclusion.
P.O. 6 -- Identify the potential investigational error that may occur (e.g., flawed investigational design, inaccurate measurement, computational errors, unethical reporting).
P.O. 7 -- Critique scientific reports from periodicals, television, or other media.
P.O. 8 -- Formulate new questions based on the results of a previous investigation.

Science, Grade 8, Strand 1, Concept 4

P.O. 1 -- Communicate the results of an investigation.

P.O. 2 -- Choose an appropriate graphic representation for collected data: line graph, double bar graph, stem and leaf plot, histogram (See M08-S2C1-03)

P.O. 3 -- Present analyses and conclusions in clear, concise formats. (See W-E6-PO1)

P.O. 4 -- Write clear, step-by-step instructions for conducting investigations or operating equipment (without the use of personal pronouns).

P.O. 5 -- Communicate the results and conclusion of the investigation.

Science, Grade 8, Strand 2, Concept 1

P.O. 1 -- Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations (e.g., Watson and Crick [scientists], support Strand 4; Rosalind Franklin [scientist], supports Strand 4; Charles Darwin [scientist], supports Strand 4; George Washington Carver [scientist, inventor], supports Strand 4; Joseph Priestley [scientist], supports Strand 5; Sir Frances Bacon [philosopher], supports Strand 5; Isaac Newton [scientist], supports Strand 5).

P.O. 2 -- Evaluate the effects of the following major scientific milestones on society: Mendelian Genetics , Newton's Laws

P.O. 3 -- Evaluate the impact of a major scientific development occurring within the past decade.

P.O. 4 -- Evaluate career opportunities related to life and physical sciences.

Science, Grade 8, Strand 2, Concept 2

P.O. 1 -- Apply the following scientific processes to other problem solving or decision making situations: observing, questioning, communicating, comparing, measuring, classifying, predicting, organizing data, inferring, genertating hypotheses, identifying variables

P.O. 2 -- Describe how scientific knowledge is subject to change as new information and/or technology challenges prevailing theories.

P.O. 3 -- Defend the principle that accurate record keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society.

P.O. 4 -- Explain why scientific claims may be questionable if based on very small samples of data, biased samples, or samples for which there was no control.

Science, Grade 8, Strand 3, Concept 1

P.O. 1 -- Analyze the risk factors associated with natural, human induced, and/or biological hazards, including: waste disposal of industrial chemicals, greenhouse gases

P.O. 2 -- Analyze possible solutions to address the environmental risks associated with chemicals and biological systems.

Science, Grade 8, Strand 3, Concept 2

P.O. 1 -- Propose viable methods of responding to an identified need or problem.

P.O. 2 -- Compare solutions to best address an identified need or problem.

P.O. 3 -- Design and construct a solution to an identified need or problem using simple classroom materials.