



IN THE AIR

Tools for Learning About Airborne Toxics Across the Curriculum

9-12 EDUCATION MODULE

Developed By:
Missouri Botanical Garden's
EarthWays Center

www.intheair.org



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Table of Contents 9-12 Education Module



Foreword—V

Reviewers & Partners —VII

Module Matrix —IX

Teacher’s Guide—1

MODULE OVERVIEW, THEME, GOALS—3
OBJECTIVES—4
A MULTIDISCIPLINARY APPROACH—4
TIME CONSTRAINTS—4
CORRELATIONS TO NATIONAL STANDARDS—6
CORRELATION TO MISSOURI’S “SHOW-ME” STANDARDS—10

Pre/Post Module Activity - “Creative Arts Project”—13

CORRELATIONS—14
OVERVIEW, GOALS, OBJECTIVES, MATERIALS—15
PROCEDURE, CONCLUSION—16
STUDENT PACKET—17

CORE Activity - “Constructing a Continuum of Commonly Held Beliefs About the Magnitude of Airborne Toxics”—23

CORRELATIONS—24
OVERVIEW, GOALS, OBJECTIVES—25
MATERIALS, VOCABULARY, PROCEDURE—26
CONCLUSION, FOR FURTHER READING & RESEARCH—27
STUDENT HANDOUTS & WORKSHEETS—29
TEACHER’S SHEET & ANSWER KEY—33

Connecting Activity #1 - “Belief Statement One: The Magnitude and Urgency of Airborne Toxics Problems Have Been Greatly Overstated”—35

CORRELATIONS—36
OVERVIEW, GOALS, OBJECTIVES—37
MATERIALS, VOCABULARY, PROCEDURE—38
CONCLUSION, FOR FURTHER READING & RESEARCH—40
STUDENT WORKSHEET—43

Connecting Activity #2 - “Belief Statement Two: Why Worry About Airborne Toxics? What You Don’t Know Won’t Hurt You” —45

CORRELATIONS—46
OVERVIEW, GOALS, OBJECTIVES—47

MATERIALS, VOCABULARY, PROCEDURE—48
CONCLUSION, FOR FURTHER READING & RESEARCH—50
EXTENSION IDEAS—50
STUDENT WORKSHEETS—52

Connecting Activity #3 - “Belief Statement Three: Airborne Toxics Are a Nuisance, but They Seriously Affect Only a Few People.” —55

CORRELATIONS—56
OVERVIEW, GOALS, OBJECTIVES—57
MATERIALS, VOCABULARY, PROCEDURE—58
CONCLUSION, FOR FURTHER READING & RESEARCH—59
EXTENSION IDEAS—60
STUDENT WORKSHEETS—61
SUPPLEMENTAL INFORMATION—63

Connecting Activity #4 - “Belief Statement Four: Airborne Toxics Are a Serious Problem, But I’m Not Responsible” —65

CORRELATIONS—66
OVERVIEW, GOALS, OBJECTIVES—67
MATERIALS—67
VOCABULARY, PROCEDURE—68
CONCLUSION—69
FOR FURTHER READING & RESEARCH—70
SKIT “WHO ME? I’M NOT RESPONSIBLE FOR AIR POLLUTION—71
STUDENT WORKSHEET—77
TEACHER ANSWER SHEET—78

Connecting Activity #5 - “Belief Statement Five: Airborne Toxics Are a Critical Problem. However, the Effects May Be Remediable” —79

CORRELATIONS—80
OVERVIEW, GOALS, OBJECTIVES—81
MATERIALS—81
VOCABULARY, PROCEDURE—82
CONCLUSION, FOR FURTHER READING & RESEARCH—83
STUDENT WORKSHEET—84
ENVIRONMENTAL GROUPS LIST—86

Background Information—87

BACKGROUND INFORMATION FOR THIS MODULE—89
KEY TERMS AS DEFINED BY THE USEPA—89
AIRBORNE TOXICS CHART—91
CONTRIBUTING SOURCES TO AIR POLLUTION—92
LEARNING ABOUT RISKS—92
A BRIEF HISTORY OF CLEAN AIR EFFORTS IN THE UNITED STATES—94
CONCLUSION, A CLOSING THOUGHT—96
FOR FURTHER READING AND RESEARCH—97
EVALUATION FORM—99

Foreword

Most students will never be scientists or engineers. If we truly want the full spectrum of students and adults to gain greater understanding about air pollution and airborne toxics, using this knowledge to affect daily decisions, then we need to meet them in their non-science interest areas. *In The Air: Tools for Learning About Airborne Toxics Across the Curriculum* uses the multi-disciplinary breadth of education – reading and communication arts, mathematics, social studies, science, art, etc. – to explore how our individual and collective behaviors produce airborne toxics. The airborne toxics information used as the basis in the modules is from the perspective of the U.S. Environmental Protection Agency, the funder of this project.

The origin of these materials came from the discovery that there was very little available to help people understand airborne toxics. Activities on acid rain or climate change were easily found, but not on airborne toxics. The St. Louis Community Air Project and the North Side (St. Louis) Clean Air Project were looking for ways to help their communities understand and manage airborne toxics. Educational material goals were to increase knowledge about air pollution (as it related to airborne toxics) and to make connections between behaviors and air quality. They had no access to appropriate materials. New materials had to:

- be low/no-cost and be usable across all age and skill levels (Kindergarten through Adult);
- use engaging multi-disciplinary activities aligned with current educational needs and standards;
- be designed to be effectively used for environmental education, meaning to be fair, accurate, action oriented, instructionally sound, useable, of appropriate depth and with an emphasis on skill building;
- emphasize how one's choices impact human health and include connections among air, water and soil.

A specialized science education is not needed to understand the concepts presented in these modules. Users will be able to understand and take specific actions to improve their air quality. We developed accessible and appropriate materials containing activities for all grade levels, formatted into the following modules: K-3, 3-6, 6-8, 9-12 and Adult. All materials have been correlated to National and Missouri education standards. The North American Association for Environmental Education's *Environmental Education Materials: Guidelines for Excellence* were used to ensure the modules met the guidelines to be well-rounded environmental education materials. We established an extensive review process using four review panels: EPA science specialists, non-EPA science specialists, formal and non-formal educators, and community members. We greatly appreciate the 69 individuals who assisted in the review process. Visit www.intheair.org where you may download all materials for free as well as provide comments and suggestions for future additions. For more information about the modules you may also call 314-577-0220.

Each module has: A) Teacher's Guide with a Module Overview, Goals, and Correlations; B) Pre- and Post-Activities; C) Core Activity—the primary activity for the module; D) One to five Connecting Activities—activities that supplement the concepts in the Core Activity, but they also stand alone as individual activities; E) Appendix—background information on airborne toxics such as key terms, risk assessment information, and a brief history on clean air efforts in the U.S.; F) Further reading and research references; G) Evaluation form.

Modules are coordinated so that all activities complement one another. The entire module may be implemented in the classroom as a unit, or you may choose to do just individual activities from one or more units as each group has different needs, interests and abilities.

Our greatest appreciation goes to the writers of these materials, Margaret Lilly and Eleanor Hall. Their creativity, incredible writing abilities and excellent understanding of the educational needs of all ages along with their belief in educating in this topic is what enabled these modules to be the exceptional materials they are today. Thank you, Margaret and Ellie.

Certainly a final thanks is due to those who choose to use *In The Air: Tools for Learning About Airborne Toxics Across the Curriculum* with their students. Without you, this excellent work goes nowhere. Each educator has the power to make a difference!

Glenda Abney, Missouri Botanical Garden
Marcus G. Rivas, U.S. Environmental Protection Agency
Project Managers
December, 2004



Dear Educators,

Humans are increasingly altering Earth's land, water, and atmosphere on local, regional, and global levels. We all need to understand that our actions do impact our living planet. *In The Air: Tools for Learning About Airborne Toxics Across the Curriculum* addresses how individual actions specifically alter the air, which in turn affects other aspects of our environment including the soil, the water, and all plants and animals. Coupled with this understanding, the lessons in *In The Air* provide tools to better manage behaviors that can be implemented where we live – in our local towns and cities and in our homes. I encourage you to utilize these excellent materials with the students and adults you work with.

We've enjoyed working on this project with the fine staff at the U.S. EPA. With your help, the information and ideas in these materials will make a difference to people of all ages. Thank you for your efforts. What a great way to start making a positive and long lasting impact, educating others.

Sincerely,
Peter H. Raven
Director
Missouri Botanical Garden

Dear Educators,

The U.S. Environmental Protection Agency (U.S. EPA) and its partners have developed a new set of educational materials. These educational materials will help us all improve our personal health and become better stewards of the environment. Healthier air, cleaner water, and better protected lands describe our mission. *In The Air: Tools for Learning About Airborne Toxics Across the Curriculum* will enable us all to be more deliberate in our choices and behaviors for improved personal health and a better environment. The decisions we make regarding products we use and how we use them make lasting impacts on air quality. The learning and behavior changes that will result after presenting the activities in these modules will make a positive and long-lasting difference in your students.

We appreciate your interest in these exciting and effective materials. Without your help, these outstanding modules developed by the staff of Missouri Botanical Garden and U.S. EPA wouldn't reach the intended audience. As an educator who uses these materials, you also are a critical part of this project. Thank you for using *In The Air: Tools for Learning About Airborne Toxics Across the Curriculum*.

Sincerely,
James B. Gulliford
Regional Administrator
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"In The Air" MODULE MATRIX

www.intheair.org



| CORE & CONNECTING ACTIVITIES | | MAIN SUBJECT AREAS | | DESCRIPTION OF ACTIVITY | |
|------------------------------|---|--|---|-------------------------|--|
| 6-8 Module | Core Activity: Puppet Show "Gloomy-Doomy Go Away!" | Health, Science, Language Arts, Fine Arts | Students participate in a puppet show to learn about the importance of clean air for personal health and safety. | | |
| | Pre-Activity #1 "Dirty Air Cards" | Health, Science | Students learn about some sources of air pollution. | | |
| | Pre-Activity #2 "Making Puppets" | Fine Arts | Students make puppets. | | |
| | Connecting Activity #1 "Clean Air /Dirty Air Worksheet" | Health, Science | Students identify cleaner air choices. | | |
| | Connecting Activity #2 "Clean Up on Gloomy-Doomy" | Health, Science | Students match polluting situations with alternative actions. | | |
| | Connecting Activity #3 "Now You See It, Now You Don't" | Health, Science | Students use their senses in identifying a potential "pollutant". | | |
| | Core Activity: Chapter Book "Matt Tackles Air Toxics" | Health, Language Arts, Science | Students read a chapter book in which a group of students explore the sources of pollution within their community and learn what choices people make to protect their air. Connecting activities are integrated within the story. | | |
| | Connecting Activity #1 "Now You See It, Now You Don't" | Health, Science | Students use their senses in identifying a potential "pollutant". | | |
| | Connecting Activity #2 "Pee Yew! Is That You?" | Health, Language Arts, Math, Science, Social Studies | Students conduct a mapping activity that demonstrates the affect of wind on airborne pollution and the pervasiveness of mobile source pollution while reinforcing the concept that we all share the same air. "Town Hall Meeting" skit allows students to examine how environmental issues interplay with other economic and social issues. | | |
| | Connecting Activity #3 "In A Shroud Of Smoke" | Fine Arts, Language Arts, Social Studies | Students analyze editorial cartoons from the 1930's to learn about an historic pollution event in St. Louis that impacted our nation's clean air efforts. Students develop their own editorial cartoon to draw attention to a current environmental issue that is important to them. | | |
| 3-6 Module | Core Activity: Classroom Game "Cleaner Air Everywhere" | Health, Language Arts, Science, Social Studies | Students compete in a classroom game that demonstrates the impact of governmental and individual decisions on our environmental quality and pocketbook. | | |
| | Connecting Activity #1 "Pee Yew! Is That You?" | Health, Language Arts, Math, Science, Social Studies | Students conduct a mapping activity that demonstrates the affect of wind on airborne pollution and the pervasiveness of mobile source pollution while reinforcing the concept that we all share the same air. "Town Hall Meeting" skit allows students to examine how environmental issues interplay with other economic and social issues. | | |
| K-3 Module | Core Activity: Chapter Book "Matt Tackles Air Toxics" | Health, Language Arts, Science | Students read a chapter book in which a group of students explore the sources of pollution within their community and learn what choices people make to protect their air. Connecting activities are integrated within the story. | | |
| | Connecting Activity #1 "Now You See It, Now You Don't" | Health, Science | Students use their senses in identifying a potential "pollutant". | | |



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“In The Air” MODULE MATRIX

| CORE & CONNECTING ACTIVITIES | | MAIN SUBJECT AREAS | | DESCRIPTION OF ACTIVITY |
|------------------------------|--|--|--|--|
| 6-8 Module (cont.) | Connecting Activity #2 “Are Household Chemicals Safe?” | Health, Science | | Students learn how to read a warning label and conduct a classroom investigation to determine if less hazardous cleaning products do an effective job. |
| | Connecting Activity #3 “TipToe Through the Toxics” | Health, Math, Science, Social Studies | | Students construct a large grid in a gymnasium, large classroom or outdoor area throughout which several “pollutants” are scattered and mapped illustrating deposition. A watershed is then configured into the results. |
| 9-12 Module | Core Activity: “Constructing a Continuum of Commonly Held Beliefs About the Magnitude of Airborne Toxics” | Health, Science, Social Studies | | Students construct a continuum of common beliefs about the seriousness of airborne toxics. Strong emphasis is placed on social themes including scientific ethics, corporate integrity, and personal responsibility. Connecting Activities examine the five belief statements in more detail. A creative arts pre/post activity is used as an assessment tool. |
| | Connecting Activity #1 Belief: “The Magnitude and Urgency of Airborne Toxics Problems Have Been Greatly Overstated” | Health, Science, Social Studies | | Students examine reasons for the differences of opinions about the seriousness of airborne toxics. In the process students study the ways scientists gather and interpret data and make predictions based on their findings. |
| | Connecting Activity #2 Belief: “Why Worry About Airborne Toxics? What You Don’t Know Won’t Hurt You” | Health, Language Arts, Science, Social Studies | | Students explore why people want to know about some unpleasant situations but not others. Students will look at the how the media can influence their ideas about personal risk. |
| | Connecting Activity #3 Belief: “Airborne Toxics Are a Nuisance, But They Seriously Affect Only a Few People” | Health, Science, Social Studies | | Students review the hydrologic cycle and are introduced to the need for a multi-media (air water, soil) approach to pollution control. |
| | Connecting Activity #4 Belief: “Airborne Toxics Are a Serious Problem, But I’m Not Responsible” | Fine Arts, Health, Science, Social Studies | | Students work in teams, to complete a “degree of accountability” worksheet. Examples of personal accountability are reinforced in a short humorous skit. |
| | Connecting Activity #5 Belief: “Airborne Toxics Are a Critical Problem; However, the Effects May Be Remediable” | Health, Language Arts, Science, Social Studies | | Students work in small groups to learn about current efforts being made to improve air quality and reduce pollution by government, environmental organizations and individuals. After the presentation of their findings to the class, students draw conclusions as to the validity of this belief statement. |
| | Core Activity: “Detox Your Domicile” Home Improvement Skit | Fine Arts, Health, Science, Social Studies, | | Adults participate in a simulated home tour presented in a home improvement show format. Moving from room to room, participants will learn the economics, health concerns, and social responsibility issues relating to airborne toxics within our homes. Participants will leave with tools and strategies for improving their personal and community environments. |

IN THE AIR

IN THE AIR

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Teacher's Guide

9-12 EDUCATION MODULE



 MISSOURI
BOTANICAL
GARDEN



IN THE AIR

9-12 Teacher's Guide

MODULE OVERVIEW

In this module, high school students investigate a continuum of common beliefs about the seriousness of airborne toxics. Students analyze and research viewpoints held by those who believe airborne toxics problems are greatly overstated to those who believe the issues are so critical that they are afraid. Though basic scientific information about airborne toxics is included in the module, strong emphasis is placed on social themes such as personal responsibility, corporate integrity, and science ethics. The module utilizes a creative arts project as a preliminary/post assessment of students' awareness of the subject. These aspects of the module make it applicable to creative arts and social science classes as well as physical science classes. All lessons and activities are linked to national and Missouri education

| |
|---|
| Recommended Grade Level: |
| 9-12 |
| Preparation Time: |
| One to three hours will be needed to read the Teacher's Guide and to integrate connecting activities. |
| Presentation Time: |
| Time required varies depending on activities chosen. |

MODULE THEME

One common thread running throughout this module is the importance of critical thinking about issues that threaten human health, safety, and environmental integrity. Students are encouraged to make up their own minds about issues, based on observation and research, not on hearsay. Another recurring module theme is that individual choices, actions, and behaviors do matter.

MODULE GOALS

- To compare and contrast knowledge about and attitudes toward airborne toxics before and after studying the module by means of a creative arts project
- To provide scientific information about airborne toxics essential for implementing the module activities
- To scrutinize five commonly held beliefs about airborne toxics and conclude, after research, whether or not the beliefs are valid
- To raise student consciousness about airborne toxics in ways that will do the following:
 1. Encourage them to become aware of personal actions that increase or decrease air pollution.
 2. Stimulate them to become informed voters and participants in air quality projects in their own communities.

MODULE OBJECTIVES

At the completion of this module, students will be able to do the following:

- Distinguish airborne toxics from other types of air pollution and explain their relationship to other pollutants.
- Differentiate between a continuum and a dichotomy and give an example of each.
- Summarize the five belief statements in this module relating to airborne toxics and briefly discuss whether research confirms or invalidates the facts behind the statements.
- Relate the meaning of “multimedia” as it is used in air pollution studies, and explain the importance of the concept.
- Give examples of how personal habits and actions may affect air quality.
- Identify the importance of becoming informed on public issues as the first step in accepting civic responsibility.

Important Notes to Teachers About This Module

A MULTIDISCIPLINARY APPROACH

This module consists of a Core Activity and five Connecting Activities that incorporate lessons from different disciplines including personal health, math, communication arts, science, fine arts, and social studies.

Encouraging high school students to become more proficient in science and mathematics is a worthy goal. Nevertheless, few students will become mathematicians and scientists. On the other hand, all students eventually become the voters and taxpayers who will determine our nation’s environmental future. Consequently, the lessons and activities in this module emphasize the social, safety, and health ramifications of airborne toxics as well the physical properties and effects of toxic substances.

TIME CONSTRAINTS

In their daydreams, writers conjure up visions of stress-free educators happily teaching every precious word of their manuscripts to fascinated students. In real life, however, they know that such a scenario is wishful thinking. This module on airborne toxics, therefore, is designed to fit many different circumstances and time frames. Each part of the module is designed to stand alone with certain modifications.

If you do the Core Activity and all five Connecting Activities of this module without any of the extensions, you will need four to six hours of preparation time and approximately thirteen class periods divided as follows:



| | Teacher's Guide & Background Information | Pre/Post Creative Arts Activity | Core Activity-Continuum | Connecting Activity 1 Belief 1 | Connecting Activity 2 Belief 2 | Connecting Activity 3 Belief 3 | Connecting Activity 4 Belief 4 | Connecting Activity 5 Belief 5 |
|-------------------|--|---------------------------------|-------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Prep Time | 2 Hours | 10 Min. | 30 Min. | 30 Min. | 30 Min. | 30 Min. | 30 Min. | 30 Min. |
| Presentation Time | | 2 Class Periods | 2 Class Periods | 2 Class Periods | 1 Class Period | 1 Class Period | 2 Class Periods | 3 Class Periods |

Below are suggestions for modifying preparation and presentation time without sacrificing the goals of the module:

Suggestion 1:

Teach the entire module, but omit some of the more time-consuming exercises of the Connecting Activities.

Suggestion 2:

Teach the Core Activity. Divide the class into five groups and assign a belief statement to each group for research and presentation to the class. An alternate suggestion is to do the above, but select (or allow the class to select) one or more of the belief statements to study in detail as time permits.

Suggestion 3:

Since the Connecting Activities of this module are multidisciplinary, team-teach with instructors of subjects other than your own.

Suggestion 4:

Use the Pre/Post Module Activity-“Creative Arts Project” as a wrap-up for the module rather than a pre/post assessment.

Correlation with National Education Standards Summary

A brief description of the standards numbered below is included following the chart.

FINE ARTS

SOURCE: Consortium of National Arts Education Associations

<http://www.education-world.com/standards/national/arts/index.shtml>

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|--|-------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| NA-VA.9-12 .1 .4 .6 NA-M.9-12.4 NA-T.9-12.4 | | | | | NA-T.9-12 .2 .3 .4 .5 | NA-VA.9-12 .1 |

HEALTH EDUCATION STANDARDS

SOURCE: American Cancer Society

<http://www.education-world.com/standards/national/nph/index.shtml>

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|---------------------------------|-------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | | NPH-H.9-12 .1 .2 .4 | NPH-H.9-12 .1 .3 .4 | NPH-H.9-12 .1 .3 .4 .5 | NPH-H.9-12 .7 | NPH-H.9-12 .7 |

LANGUAGE ARTS

SOURCE: National Council of Teachers of English

http://www.education-world.com/standards/national/lang_arts/index.shtml

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|---------------------------------|-------------------------|-------------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | NL-ENG. K-12.3 .4 .7 | NL-ENG. K-12.3 .4 .5 .6 .7 .8 | NL-ENG. K-12.3 .4 .6 .7 .8 | NL-ENG. K-12.3 .4 | NL-ENG. K-12.3 .4 .7 .8 | NL-ENG. K-12.3 .4 .7 .8 |

MATHEMATICS

SOURCE: National Council of Teachers of Mathematics

<http://www.education-world.com/standards/national/math/index.shtml>

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|---------------------------------|-------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | NM-PROB. REP.PK-12.3 | NM-PROB. REP.PK-12.3 | | | NM-PROB. REP.PK-12.3 | |

SCIENCE

SOURCE: National Academies of Science

<http://www.education-world.com/standards/national/science/index.shtml>

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|---------------------------------|-------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | NS.9-12.1 .6 | NS.9-12.1 .2 .4 .5 .6 .7 | NS.9-12 .1 .3 .6 | NS.9-12 .1 .4 .6 | NS.9-12 .1 .6 | NS.9-12.6 |

SOCIAL SCIENCES

SOURCE: National Council for the Social Sciences (NCSS), Center for Civic Education, and the National Geographic Society (NGS)

http://www.education-world.com/standards/national/soc_sci/index.shtml

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|---------------------------------|---|---------------------------------|---------------------------------|---|---|---|
| | NSS-C.9-12 .5 (Civic Ed.) Strands VIII, IX, X (NCSS) | Strands VIII, IX, X (NCSS) | Strands VIII, IX, X (NCSS) | NSS-C.9-12 .5 (Civic Ed.) Strands VIII, IX, X (NCSS) | NSS-C.9-12 .5 (Civic Ed.) Strands VIII, IX, X (NCSS) | NSS-C.9-12 .5 (Civic Ed.) Strands VIII, IX, X (NCSS) |

TECHNOLOGY

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

http://www.educationworld.com/standards/national/technology/k_12.shtml

| Pre/Post Creative Arts Activity | Core Activity Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|---------------------------------|-------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | NT.K-12.2 | NT.K-12.2 | NT.K-12.2 | NT.K-12.2 | NT.K-12.2 | NT.K-12 .2 .5 |

Correlation with National Education Standards- (cont.)

FINE ARTS (Depending upon choices students make for their projects)

- VISUAL ARTS: NA-VA.9-12.1: Understanding and Applying Media, Techniques, And Processes.
- VISUAL ARTS: NA-VA.9-12.4: Understanding the Visual Arts in Relation to History and Cultures.
- VISUAL ARTS: NA-VA.9-12.6: Making Connections Between Visual Arts and Other Disciplines.
- MUSIC: NA-M.9-12.4: Composing and Arranging Music Within Specified Guidelines
- THEATER: NA-T.9-12.2 Students in an ensemble, create and sustain characters that communicate with audiences.
- THEATER: NA-T.9-12.3: Students develop designs that use visual and aural elements to convey environments that clearly support the text; Students apply technical knowledge and skills to collaboratively and safely create functional scenery, properties, lighting, sound, costumes, and makeup.
- THEATER: NA-T.9-12.4: Students collaborate with designers and actors to develop aesthetically unified production concepts for informal and formal theatre, film, television, or electronic media productions.
- THEATER: NA-T.9-12.5: Students identify and research cultural, historical, and symbolic clues in dramatic texts, and evaluate the validity and practicality of the information to assist in making artistic choices for informal and formal productions.

HEALTH EDUCATION

- NPH-H.9-12.1: Students will comprehend concepts related to health promotion and disease prevention.
- NPH-H.9-12.2: Students will demonstrate the ability to access valid health information and health-promoting products and services.
- NPH-H.9-12.3: Students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks.
- NPH-H.9-12.4: Students will analyze the influence of culture, media, technology, and other factors on health.
- NPH-H.9-12.5: Students will demonstrate the ability to use interpersonal communication skills to enhance health.
- NPH-H.9-12.7: Students will demonstrate the ability to advocate for personal, family, and community health.

LANGUAGE ARTS

- NL-ENG.K-12.3: EVALUATION STRATEGIES 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).
- NL-ENG.K-12.4: COMMUNICATION SKILLS: 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.

- 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.
- NL-ENG.K-12.6: APPLYING KNOWLEDGE: 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 non print texts.
- 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 non print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
- NL-ENG.K-12.8: DEVELOPING RESEARCH SKILLS: 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.

MATHEMATICS

- NM-PROB.REP.PK-12.3: Use representations to model and interpret physical, social, and mathematical phenomena.

SCIENCE

- NS.9-12.1: Students should develop: Abilities necessary to do scientific inquiry; Understandings about scientific inquiry.
- NS.9-12.2: Students should develop an understanding of chemical reactions; motions and forces; conservation of energy and increase in disorder; interactions of energy and matter.
- NS.9-12.3: Students should develop an understanding of: Interdependence of organisms; Matter, energy, and organization in living systems.
- NS.9-12.4: Students should develop an understanding of energy in the earth system and geochemical cycles.
- NS.9-12.5: Students should develop understandings about science and technology.
- NS.9-12.6: Students should develop an understanding of personal and community health, natural resources, environmental quality, natural and human-induced hazards, and science and technology in local, national, and global challenges.
- NS.9-12.7: Students should develop an understanding of science as a human endeavor, nature of scientific knowledge, historical perspectives.

SOCIAL SCIENCE

- NSS-C.9-12.5 (Civic Ed.): What are the roles of the citizen in American democracy?
- NCSS Strand VIII: Science, technology, and society.
- NCSS Strand IX: Global connections and interdependence.
- NCSS Strand X: Civic ideals and practices.

SOCIAL SCIENCE

- NT.K-12.2: Students understand the ethical, cultural, and societal issues related to technology. Students practice responsible use of technology systems, information, and software. Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- NT.K-12.5 Students use technology to locate, evaluate, and collect information from a variety of sources. Students use technology tools to process data and report results. Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

Correlation with Missouri "Show-Me" Standards

MISSOURI ASSESSMENT PROGRAM: FOUR PERFORMANCE STANDARDS & SIX KNOWLEDGE STANDARDS

SOURCE: Show-Me Standards and the Missouri Assessment Program,
Missouri Department of Elementary and Secondary Education, 1998
<http://www.dese.mo.gov/standards>

| | Pre/Post Creative Arts Activity | Core Activity - Continuum | Connecting Activity #1 Belief 1 | Connecting Activity #2 Belief 2 | Connecting Activity #3 Belief 3 | Connecting Activity #4 Belief 4 | Connecting Activity #5 Belief 5 |
|--|---------------------------------|---------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| PERFORMANCE STANDARDS | | | | | | | |
| Goal 1. Gather and Analyze Information | 4, 5, 6, 8 | 6, 8, 10 | 1, 2, 3, 4, 7, 8, 10 | 2, 4, 6, 7, 8, 10 | 2, 3, 4, 6, 7, 8 | 1, 2, 4, 7, 8 | 1, 2, 4, 5, 7, 8, 10 |
| Goal 2. Communicate Effectively | 1, 2, 5, 6 | 2, 3 | 3, 7 | 1, 2, 3, 7 | 3 | 1, 2, 3, 5, 7 | 1, 2, 3, 5, 7 |
| Goal 3. Solve Problems | | 1, 5, 6, 7 | 1, 4, 5, 6 | 1, 4, 6, 7 | 1, 4, 6 | 1, 6 | 1, 6, 7 |
| Goal 4. Make Decisions | 1, 2, 6 | 1, 6, 7 | 1, 4, 7 | 1, 5, 7 | 3 | 1, 3, 6 | 1, 3, 5, 6 |
| KNOWLEDGE STANDARDS | | | | | | | |
| Communication Arts | 1, 4, 5, 6 | 1, 4, 5, 6 | 1, 3, 6 | 1, 3, 4, 5, 6 | 6 | 1, 4, 5, 6 | 1, 3, 4, 5, 6 |
| Fine Arts | 1, 2, 4, 5 | | | | | 1 | 1 |
| Health / Physical Education | 6 | 6 | 6 | 5, 6 | 5, 6 | 5, 6 | 5, 6 |
| Science | 8 | 8 | 1, 4, 5, 7, 8 | 3, 4, 7, 8 | 4, 5, 8 | 5, 8 | 4, 8 |
| Social Studies | 6 | 6, 7 | 5, 7 | 7 | 2, 5 | 2, 5 | 2, 6, 7 |

PERFORMANCE STANDARDS

Students will demonstrate within and integrate across all content areas the ability to:

GOAL #1 - Gather & Analyze Information

- #1. develop questions and ideas to initiate and refine research.
- #2. conduct research to answer questions and evaluate information and ideas.
- #3. design and conduct field and laboratory investigations to study nature and society.
- #4. use technological tools and other resources to locate, select and organize information.
- #5. comprehend and evaluate written, visual and oral presentations and works.
- #6. discover and evaluate patterns and relationships in information, ideas and structures.
- #7. evaluate the accuracy of information and the reliability of its sources.
- #8. organize data, information and ideas into useful forms (including charts, graphs, outlines) for analysis or presentation.
- #10. apply acquired information, ideas and skills to different contexts as students, workers, citizens and consumers.

GOAL #2 - Communicate Effectively

- #1. plan and make written, oral and visual presentations for a variety of purposes and audiences.
- #2. review and revise communications to improve accuracy and clarity.
- #3. exchange information, questions and ideas while recognizing the perspectives of others.
- #5. perform or produce works in the fine and practical arts.
- #6. apply communication techniques to the job search and to the workplace.
- #7. use technological tools to exchange information and ideas.

GOAL #3 - Solve Problems

- #1. identify problems and define their scope and elements.
- #4. evaluate the processes used in recognizing and solving problems.
- #5. reason inductively from a set of specific facts and deductively from a set of general premises.
- #6. examine problems and proposed solutions from multiple perspectives.
- #7. evaluate the extent to which a strategy addresses the problem.

GOAL #4 - Make Decisions

- #1. explain reasoning and identify information used to support decisions.
- #2. understand and apply the rights and responsibilities of citizenship in Missouri and the United States.
- #3. analyze the duties and responsibilities of individuals in societies.
- #4. recognize and practice honesty and integrity in academic work and in the workplace.
- #5. develop, monitor and revise plans of action to meet deadlines and accomplish goals.
- #6. identify tasks that require a coordinated effort and work with others to complete those tasks.
- #7. identify and apply practices that preserve and enhance the safety and health of self and others.

KNOWLEDGE STANDARDS

Students in Missouri public schools will acquire a solid foundation which includes knowledge of:

COMMUNICATION ARTS

- #1. speaking and writing standard English (including grammar, usage, punctuation, spelling, capitalization).
- #3. reading and evaluating nonfiction works and material (such as biographies, newspapers, technical manuals).
- #4. writing formally (such as reports, narratives, essays) and informally (such as outlines, notes).
- #5. comprehending and evaluating the content and artistic aspects of oral and visual presentations (such as story-telling, debates, lectures, multi-media productions).
- #6. participating in formal and informal presentations and discussions of issues and ideas.

FINE ARTS

- #1. process and techniques for the production, exhibition or performance of one or more of the visual or performed arts.
- #2. the principles and elements of different art forms.
- #4. interrelationships of visual and performing arts and the relationships of the arts to other disciplines.
- #5. visual and performing arts in historical and cultural contexts.

HEALTH / PHYSICAL EDUCATION

- #5. methods used to assess health, reduce risk factors, and avoid high-risk behaviors (such as violence, tobacco, alcohol and other drug use).
- #6. Consumer health issues (such as the effects of mass media and technologies on safety and health).

SCIENCE

- #1. properties and principles of matter and energy.
- #3. characteristics and interactions of living organisms.
- #4. changes in ecosystems and interactions of organisms with their environments.
- #5. processes (such as plate movement, water cycle, air flow) and interactions of the earth's biosphere, atmosphere, lithosphere, and hydrosphere.
- #7. processes of scientific inquiry (such as formulating and testing hypotheses).
- #8. Impact of science, technology and human activity on resources and the environment.

SOCIAL STUDIES

- #2. continuity and change in the history of Missouri, the United States and the world.
- #5. the major elements of geographical study and analysis (such as location, place, movement, regions) and their relationships to changes in society and environment.
- #6. relationships of the individual and groups to institutions and cultural traditions.
- #7. the use of tools of social science inquiry (such as surveys, statistics, maps, documents).