Wisconsin Environmental Science Course Framework

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The *Wisconsin Environmental Science Course Framework* was produced by the Wisconsin Environmental Science Teacher Network, a program of the Wisconsin Center for Environmental Education in the College of Natural Resources at the University of Wisconsin-Stevens Point. The Wisconsin Center for Environmental Education was established by the Wisconsin State Legislature in 1990 to assist in the development, dissemination, implementation and evaluation of teacher and student K-12 environmental education programs in Wisconsin.

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Framework Development Process

Environmental science is a growing area of study with new courses being developed each year. The Wisconsin Center for Environmental Education has received an increasing number of requests for an environmental science course framework and associated resources. This document was created in response to those requests.

This framework was developed with statewide input from many individuals. A core group of veteran secondary level environmental science teachers along with the Wisconsin Environmental Science Teacher Network Coordinator created the initial framework outline. Multiple environmental science resources were referenced throughout the creation process.

Once complete, the framework document was distributed to thirty five reviewers including environmental science teachers, natural resource professionals, environmental education specialists, and university level environmental science professors and pre-service instructors.

A subset of the reviewers examined the compiled comments and determined necessary changes. A final team of educators refined the document to its current form. The framework is dynamic and will be modified to reflect changes as needed.

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Bold italicized words are defined in the glossary on page 11.

Superscript numbers(00) indicate specific references cited in the endnotes on page 14.

Rationale for Environmental Science Education

One of the greatest challenges and opportunities of the 21st century is ***sustainability***. Achieving sustainability will require students to discover how to meet the needs of the human population while protecting the capacity of the earth to sustain human and other life. To prepare students for this challenge, we must help them understand and recognize that the quality of our environment determines our long-term economic and social health. This can be accomplished through an environmental science course that emphasizes the basic laws of ecology and a comprehensive, ***systems-based understanding*** of our world. Environmental science courses provide a setting in which students learn about challenges facing our society and prepare them to be leaders and decision makers that move our society toward sustainability. Our future depends on education. Environmental science is an essential component of education.

According to Wisconsin's Model Academic Standards for Life and Environmental Science, "students will enhance their natural curiosity about living things and their environment through study of the structure and function of living things, ecosystems, life cycles, energy movement and change, and changes in populations of organisms through time. Knowledge of these concepts and processes of life and environmental science will assist students in making informed choices regarding their lifestyles and the impact they have on communities of living things in their environment."[1] A well designed environmental science course based on the *Wisconsin Environmental Science Course Framework* meets this description outlined by the Wisconsin Department of Public Instruction, as well as meeting standards for science, environmental education, agriculture education, social studies, and other subject areas (see Appendix pages 12-14). Environmental science courses also play an important role in introducing students to career opportunities in environmental and natural resources fields.

The topics of an environmental science course make it easy to incorporate effective educational approaches such as utilizing current issues, connecting with community resources, and engaging students in ***service learning*** and ***project-based learning***. In addition to making concepts relevant to students, integrating current issues into curriculum assists students in becoming global citizens who understand connections between their environment, economy, and society. Service and project-based learning help students connect with their community, gain a sense of accomplishment, and transfer classroom learning to real-world situations. Environmental science courses provide the setting for effective and essential education.

Ultimately, environmental science education helps students understand their relationship to the natural world in which they live and make decisions that will influence the sustainability of our society and the life support systems of the planet.

Purpose of this Framework

The purpose of having an environmental science course framework is to provide a consistent foundation upon which environmental science courses in Wisconsin can be developed. Topics in the framework are prioritized to help in planning courses of varied length. The framework is not intended to serve as a curriculum.

The framework will aid new teachers in implementing environmental science courses, provide veteran environmental science teachers with new ideas, and facilitate the sharing of ideas and resources between educators. The complete framework is available online with an accompanying digital resource library. The library facilitates the sharing of resources used to teach each topic including activities, labs, assessments, videos, web sites, guest speakers, field trips, etc. (http://www.uwsp.edu/wcee/envsci).

The framework is a dynamic document that will evolve and be revised to reflect new developments in the science and environmental communities, trends in education, and teacher needs.

About the Wisconsin Environmental Science Teacher Network

The Wisconsin Environmental Science Teacher Network was created in late 2006 to help environmental science teachers connect with one another, with resources, and with professional development opportunities to enhance environmental science education in Wisconsin's secondary level classrooms. The Wisconsin Center for Environmental Education (WCEE) formed the Network in response to expressed need by Wisconsin's environmental science teachers for greater support and more resources. The vision of the Network is to increase the environmental literacy of Wisconsin's students by providing exemplary environmental science opportunities and resources.

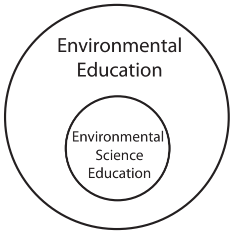
To accomplish its goals, the Network offers a variety of resources to educators and facilitates a communication network through a quarterly electronic newsletter. The *Wisconsin Environmental Science Course Framework* will serve as a foundation for educators to enhance their courses and share resources. Future resources based on the framework may include professional development opportunities such as environmental science focused conferences, courses, and resource creation.

The Network is teacher driven and depends on the active participation of the environmental science educators in Wisconsin. Educators at all grade levels and teaching all subjects are welcome to be part of the Network. The target audience is secondary educators teaching environmental science/studies, ecology, natural resources, conservation, or related subjects.

Learn more about the Network online: http://www.uwsp.edu/wcee/envsci.

Environmental Education and Environmental Science Education

Environmental science education is not the same as environmental education although each one incorporates aspects of the other. Environmental science is a core component of environmental education as diagramed on the right.



Environmental Science
"Environmental science is an interdisciplinary study that integrates information and ideas from the natural sciences and the social sciences to study the relationships between organisms and the environment."[2] Environmental science includes teaching skills for critical analysis of evidence (data).

Environmental Education
Environmental education (EE) is defined as "a lifelong learning process that leads to an informed and involved citizenry having the creative problem-solving skills, scientific and social literacy, ethical awareness and sensitivity for the relationship between humans and the environment, and commitment to engage in responsible individual and cooperative actions. By these actions, environmentally literate citizens will help ensure an ecologically and economically sustainable environment."[3] Environmental education includes five key goals: awareness, knowledge, ethics, skills, and experience (see Appendix pg. 12). The final goal of experience or action is key to environmental education.

Relationship
Environmental science education encompasses many of the goals of environmental education, especially focusing on awareness and knowledge. Depending on a particular teacher and a particular course, the additional environmental education goals of ethics, skills, and experience may be incorporated. A well designed environmental science course can incorporate both an emphasis on understanding science processes and concepts as well as development of an environmental ethic and teaching skills for citizen action.

Framework Overview

Organization

The framework is organized into themes, topics, concepts, and subconcepts. The themes are meant to be woven throughout the framework at all levels. The topics, concepts, and subconcepts increase in level of specificity.

THEMES
Topics
Concepts
Subconcepts

Definitions

The following terms are defined relative to their use in this document.

Themes – Guiding principles that are interwoven through environmental science topics, concepts, and subconcepts. They provide both a focus and organizing framework that guide the development and implementation of a cohesive, interrelated series of lessons or activities.

Topics – Main areas of study within the environmental science framework. Topics encompass multiple supporting concepts.

Concepts – Specific categories of information that support the topics in the framework. Concepts are explained or exemplified by associated subconcepts.

Subconcepts – Specific information or examples that support concepts in the framework.

Framework Use

This framework is designed for secondary level environmental science courses. Its structure gives individual instructors flexibility to design a course that meets their needs, their students' needs, and the needs of their district curriculum. Teachers are encouraged to place greater emphasis on topics not thoroughly covered in other areas of the district curriculum. The framework is not a curriculum in itself.

In addition to environmental science, the framework is applicable to courses such as ecology, natural resources, conservation, and environmental studies. Agriculture education instructors and instructors of topic specific courses such as wildlife and water may also find portions of the framework useful. Advance placement (AP) environmental science instructors can use the framework to develop their courses and insert additional material required for the College Board exam where applicable.

Course Length

The framework identifies a comprehensive outline of topics and their associated concepts and subconcepts that would be ideally taught in a year-long course. For semester, block, or half-year courses, the priority topics have been starred (*) to assist in planning. Starred topics along with their associated concepts and subconcepts are priority for half-year courses and are listed in a suggested order.

If there is time in a half-year course to include more than the starred topics, choose from the remaining topics in the framework based on personal preference, student interest/needs, and local resources/issues. These additional topics may be included after the starred topics are taught or integrated into the teaching of the starred topics where appropriate.

Course Resources

Specific activities are not included in the framework. A digital resource library of environmental science activities, labs, assessments, videos, web sites, guest speakers, field trips and other resources that support the framework is being compiled. This online resource provides sharing opportunities for environmental science teachers statewide. The resource library is accessible at: http://www.uwsp.edu/wcee/envsci.

The Framework

Themes

Environmental science is interdisciplinary; it embraces a variety of topics from different areas of study. There are several guiding principles, or themes, that cut across the many topics included in the study of environmental science. The following themes are the big ideas that students should take away from an environmental science course. The themes should not be taught in isolation but should be woven throughout all topics, concepts, and subconcepts that comprise a course.[4]

Science is a process

- Science is a pathway to understanding the natural world
- Scientific understandings change over time as new evidence is found

Energy conversions and the cycling of matter underlie all ecological processes

- Energy cannot be created; it must come from somewhere
- As energy flows through systems, at each step more of it becomes unusable
- Matter cannot be created or destroyed, although it may be rearranged

Earth is one interconnected system

- Biotic and abiotic components exist in a dynamic relationship with one another
- Natural systems change over time and space
- Biogeochemical systems vary in their ability to recover from disturbances

Humans alter natural systems

- Humans have had and will continue to have an impact on the environment
- Technology and population growth have increased both the rate and scale of human impact on the environment

Environmental problems have a cultural and social context

- Understanding the role of cultural, social, and economic factors is vital to the development of solutions

Human survival depends on developing practices that will achieve sustainable systems

- Assessing one's personal ecological footprint and lifestyle choices is important
- A balanced approach to conservation and development is required
- Management of natural resources is essential for achieving sustainable systems
- Development of a personal environmental ethic helps one make choices and accept responsibility for those choices

Topics, Concepts, Subconcepts

Starred (*) Topics = priorities for an environmental science course; includes all concepts and subconcepts below each. The concepts and subconcepts under each topic can be taught in the order the instructor feels is appropriate.

* Course Introduction

The goal of the course introduction is to introduce the themes listed on page 6. The order in which the introductory concepts are taught is up to the discretion of the instructor. Things one might consider including are:

- Quality of life/Quality of environment
- ***Ecological footprint***
- ***Maslow's needs hierarchy***
- Population
- ***Tragedy of the commons***
- Environmental problems and issues
- Timeline of environmental history
- Environmental leaders
- Environmental careers

* A. Ecological Principles

1. ***Commoner's laws of ecology***
    a. "Everything is connected to everything else"
    b. "Everything must go somewhere"
    c. "Nature knows best"
    d. "There is no such thing as a free lunch"
2. Energy primer
    a. Definition
    b. Laws of energy
    c. Types of energy
3. Evolution
    a. Natural selection
    b. Environmental adaptations and ecological niche
    c. Speciation, biodiversity, co-evolution, extinction
    d. Rates of evolution – gradualism vs. punctuated equilibrium
4. Organismal ecology
    a. Unit of natural selection – survival and reproduction
    b. Kingdoms of life and requirements for life
    c. Habitat, environmental adaptations, and ecological niche
    d. Homeostasis and feedback regulation – thermoregulation, osmoregulation, gas exchange, energetics
    e. Cellular metabolism – photosynthesis, cellular respiration, chemosynthesis
5. Population ecology
    a. Population dynamics – exponential vs. logistic growth
    b. Carrying capacity and limiting factors
    c. Population structure – age, gender, survivorship
    d. Population genetics and genetic diversity
6. Community ecology
    a. Species interactions – resource competition, predation, symbiosis
    b. Competitive exclusion principle
    c. Niche partitioning and keystone species
    d. Species biodiversity
    e. Ecological succession – primary vs. secondary
    f. Disturbance
7. Ecosystem ecology
    a. Matter/Biogeochemical cycles (biotic/abiotic) – water, carbon, nitrogen, phosphorous, sulfur
    b. Energy flow – trophic levels, food pyramids, food webs
    c. Thermodynamics – 1st law (conservation of energy) and 2nd law (entropy)
    d. Biomes – environmental factors influencing distribution
    e. Value of ecosystem services
8. Biosphere ecology
    a. Global energy flow – solar input, ocean currents, air mass circulation
    b. Global matter cycling – global biogeochemical cycles
    c. Global biodiversity – species distribution and abundance
    d. Plate tectonics – theory of continental drift
    e. Global environmental issues – extinction crisis, climate change, etc.

* B. Human Systems

1. Human well-being and environmental quality
    a. Interdependence
    b. Sustainability
2. Consumption of natural resources
    a. Population – world population, exponential growth, birth/death rate, age structure, migration, historical patterns
    b. Technology
    c. Affluence
3. Effects of natural resource consumption
    a. Societal development – affluence, health, culture, economic growth
    b. Resource distribution – food/water distribution, nourishment, wealth gap
    c. Waste – reduce, reuse, recycle, refuse; toxic waste; pollution
    d. Cultural diversity threats – loss of local traditions, language, indigenous wisdom
    e. Variability – socioeconomic status, race, culture, ethnicity, etc.
4. Actions and solutions
    a. Education – empowerment of women, needs hierarchy
    b. Political action – laws, lobbying, environmental justice
    c. Ecomanagement – trail building, recycling, ecosystem restoration
    d. Legal action – lawsuits, law enforcement
    e. Lifestyle choices – ecological footprint, consumer choices
    f. Community involvement – service learning, ecomunicipalities

C. Energy Resources

1. Renewable/nonrenewable sources
    a. Examples – coal, oil, natural gas, nuclear, solar, wind, geothermal, hydro, biomass, tidal
    b. Benefits and limitations
    c. Projected reserves/availability
2. Human use
    a. Historical use
    b. Community sectors – transportation, agricultural, industrial, municipal, commercial, residential
    c. Demands and consumption
3. Effects
    a. Environmental – pollution, climate change, mining issues, waste management, habitat destruction
    b. Human health
    c. Economic
    d. Political - war, legislation, border issues
4. Solutions
    a. Technology
    b. Projected reserves/availability
    c. Demands and consumption
    d. Lifestyle changes

D. Air Resources

1. Atmospheric science
    a. Atmospheric composition and structure
    b. Weather and climate – relationship between sun, wind, and ocean currents; difference between weather and climate; historical patterns
2. Human use
    a. Biological
    b. Combustion
    c. Work – transportation, wind energy generation
    d. Waste disposal
3. Pollution
    a. Types of pollutants – primary, secondary, synergistic
    b. Source of pollutants – natural and anthropogenic
    c. Impacts of pollutants – ozone depletion, smog, acid precipitation, heat islands, inversions, health issues
    d. Solutions or reductions
4. Climate change
    a. Natural greenhouse effect
    b. Greenhouse gases
    c. ***Keeling Curve***
    d. Impacts/consequences
    e. Data interpretation and computer modeling
    f. Solutions

E. Land Resources

1. Soil science
    a. Formation
    b. Rock cycle
    c. Layers
    d. Composition
    e. Soil chemistry
    f. Soil mapping
    g. Soil community
    h. Glaciation
2. Terrestrial ecosystems
    a. Forests
    b. Prairie/grassland
    c. Desert
    d. Tundra
3. Land use
    a. Minerals/mining
    b. Agriculture
    c. Forestry
    d. Rangeland
    e. Wilderness
    f. Public lands
    g. Private land
    h. Urbanization
    i. Solid waste
4. Effects of human use
    a. Desertification
    b. Salinization
    c. Alkalinization
    d. Erosion
    e. Fragmentation
    f. Habitat loss
5. Planning and management
    a. Historical – exploitation, conservation, reservation
    b. Managing land use – mitigation, reclamation, multiple use, green space/open space, comprehensive planning/smart growth

F. Water Resources

1. Characteristics of water on Earth
    a. Properties of water
    b. Physical, chemical, biological aspects (adaptations)
    c. Distribution
    d. Watersheds
2. Surface water
    a. Fresh – lakes, streams and rivers, wetlands
    b. Estuaries
    c. Salt – oceans
3. Groundwater
    a. Models
    b. Aquifer
    c. Artesian well
    d. Water table
    e. Zones – cone of depression, recharge, saltwater intrusion
4. Human use
    a. Historical use
    b. Use sectors – agricultural, residential, commercial (including fisheries), municipal, industrial
    c. Demands and consumption
5. Impacts of water use
    a. Shortages
    b. Salinization
    c. Pollution/contamination – point vs. non-point
    d. Erosion
    e. Waste management
    f. Storm water/flooding
    g. Water diversion
6. Sustainable use of water/solutions
    a. Conservation and preservation
    b. Reduced use
    c. Irrigation management
    d. Water rationing

G. Living Resources & Biodiversity

1. Living resources
    a. Food
    b. Shelter
    c. Clothing
    d. Recreation
2. Levels of biodiversity
    a. Genetic
    b. Species
    c. Ecosystem
3. Distribution of biodiversity
    a. Species distribution
    b. Hotspots
4. Value of biodiversity
    a. Economic
    b. Aesthetic and spiritual
    c. Ecologic
    d. Intrinsic
    e. Recreation and health
    f. Education
5. Threats to biodiversity
    a. Habitat destruction, fragmentation, climate change
    b. Invasive/Non-native species
    c. Pollution
    d. Bioaccumulation and biomagnification
    e. Human population growth
    f. Overexploitation and illegal trade
    g. Characteristics of extinction prone species
6. Classification of species
    a. Stable species
    b. Endangered species
    c. Threatened species
    d. Extirpated and extinct species
    e. Game/non-game species
    f. Invasive species
7. Protecting biodiversity
    a. Species vs. ecosystem approach
    b. Wildlife management
    c. Preservation/conservation/restoration
    d. Regulation
    e. Education
    f. Habitat management

*Course Conclusion

The purpose of the course conclusion is to summarize what has been taught in the course. The themes should be used to connect the information shared during the course and to provide an overall message about the importance of environmental science. Following are ideas of what can be included in the course conclusion:

- Review environmental issues relevant to the topics discussed; revisit the idea that environmental problems have a cultural and social context; explore interconnections among topics and issues
- Discuss solutions to environmental issues that will lead to sustainable systems; relate the importance of management of common resources
- Discuss environmental leaders
- Emphasize that human survival depends on developing practices that will achieve sustainable systems
- Identify what students can do – civic responsibilities, examine ecological footprint, career choices
- Future prospects for studies – technology, reserves, demand, careers, balance between conservation and development

Glossary

Commoner's laws of ecology

Barry Commoner is a biologist who described four laws of ecology in his 1971 book *The Closing Circle*. The four laws are: everything is connected to everything else; everything must go somewhere; nature knows best; there is no such thing as a free lunch.

Ecological footprint

Ecological footprint is a concept as well as a type of analysis. The concept of ecological footprint examines human demand placed on the environment and natural resources as compared to the planet's ability to provide for this demand. An ecological footprint analysis is used to measure consumption and lifestyle to determine how much land and sea area would be needed to regenerate the resources the human population consumes.

Keeling Curve

The Keeling Curve is a graph showing the variation in concentration of atmospheric carbon dioxide. It is based on continuous measurements taken under the supervision of Charles David Keeling since 1958. Keeling was the first to report and provide evidence of rapidly increasing carbon dioxide levels in the atmosphere.

Maslow's needs hierarchy

Maslow's hierarchy of needs is a theory in psychology that Abraham Maslow proposed in his 1943 paper *A Theory of Human Motivation*. Maslow's hierarchy of needs is often depicted as a pyramid consisting of five levels. Lower level needs must be met before higher level needs. The five levels from bottom to top are physiological, safety, love/belonging, esteem, self-actualization.

Project-based learning

In project-based learning, students explore real-world problems and challenges that involve problem solving, decision making, investigative skills, and reflection with teacher facilitation. They work in small collaborative groups where they are active, engaged, and inspired to obtain new skills and a deeper knowledge of the subjects they are studying.

Service learning

Service learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.[5]

Sustainability

Sustainability is generally defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." (See Appendix page 12.)

Systems-based understanding

Having a systems-based understanding means recognizing that everything exists within a larger system and in relationship to other parts of that system. This is based on the belief that the parts of a system act or appear differently when the relationships between parts are removed. The only way to fully understand why a problem or element occurs and persists is to understand the part in relation to the whole.

Tragedy of the commons

The Tragedy of the commons occurs when there is conflict over finite natural resources that everyone needs to survive but no one owns (e.g., air, water). No one using these natural resources has to pay back into the natural system. There are some who will try to consume all of the available resources before someone else uses them. Free access and unrestricted demand for a finite resource ultimately dooms the resource through over-exploitation. The Tragedy of the commons was described by biologist Garrett Hardin in a 1968 article "Tragedy of the Commons" in the journal *Science*.

Appendix

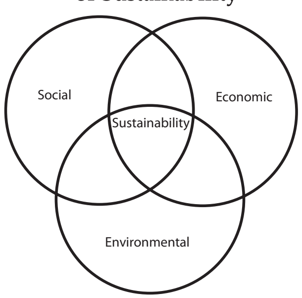
Sustainability

Sustainability is generally defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."[6]

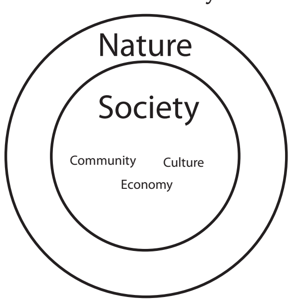
Sustainability is often depicted as three overlapping circles. The circles represent social, environmental, and economic aspects of our world. Actions must be socially just, economically feasible, and environmentally safe to be sustainable. This depiction gives equal weight to the three aspects.

Another depiction of sustainability shows human society as a subset within the natural system. Economics and other aspects are a part of our social system. This representation portrays nature as being the foundation of society; therefore, environmental health is the overriding consideration for sustainability with society needing to adjust to living within the limits of the natural world. Aspects of society (e.g., the economy) would then need to be developed which support that relationship.

Overlapping Circles of Sustainability



Concentric Systems of Sustainability



Environmental Education Goals

There are five goals of environmental education.[7]

- **Perceptual Awareness:** To help students develop the ability to perceive and discriminate among stimuli; to process, refine, and extend those perceptions; and to concurrently acquire an aesthetic sensitivity to both natural and built environments.
- **Knowledge:** To help students acquire a basic understanding of how the natural environment functions, how its functioning is affected by human activity, and how harmony between human activity and the natural environment may be achieved.
- **Environmental Ethic:** To help students develop a universal ethic on which they may act to defend, improve, and sustain the quality of the environment.
- **Citizen Action Skills:** To help students develop the skills needed to identify, investigate, and take action toward the prevention and resolution of environmental issues.
- **Citizen Action Experience:** To help students gain experience in applying acquired perceptual awareness, knowledge, an environmental ethic, and citizen action skills in working toward the prevention and resolution of environmental issues at all levels, local through universal.

Wisconsin Model Academic Standards

The Wisconsin Model Academic standards specify what students should know and be able to do, what they might be asked to do to give evidence of standards, and how well they must perform. They include content, performance, and proficiency standards. Environmental science concepts are interdisciplinary and may include standards from multiple areas. Four standards areas closely associated with environmental science are listed here.

Agriculture Education

Content Standards

- Students in Wisconsin will learn about the role of food, fiber, and natural resource systems in their lives and the lives of others around the world.
- Students in Wisconsin will demonstrate the ability to access information from multiple sources, synthesize the

information, and use it for the technological improvement and stewardship of food, fiber, and natural resource systems.
- Students in Wisconsin will learn about leadership as it affects individuals, organizations, and systems in food, fiber, and natural resources enterprises.
- Students in Wisconsin will demonstrate an understanding of the scientific principles and societal implications involved in the production and processing of food and fiber as well as in the ornamental horticulture industry.
- Students in Wisconsin will understand the relationships between natural resources, ecological processes, and the production and processing of food and fiber.
- Students in Wisconsin will learn about the operations and economic impact of agricultural business in a world economy.

Performance Standards can be found at:
http://dpi.wi.gov/standards/pdf/agried.pdf

Environmental Education
Content Standards
- Students in Wisconsin will use credible research methods to investigate environmental questions, revise their personal understanding to accommodate new knowledge and perspectives, and be able to communicate this understanding to others.
- Students in Wisconsin will demonstrate an understanding of the natural environment and the interrelationships among natural systems.
- Students in Wisconsin will be able to identify, investigate, and evaluate environmental problems and issues.
- Students in Wisconsin will use findings from environmental issue investigations to develop decision-making skills, and to gain experience in citizen action skills.
- Students in Wisconsin will develop an understanding and commitment to environmental stewardship.

Performance Standards can be found at:
http://dpi.wi.gov/standards/pdf/envired.pdf

Science
Content Standards
- Students in Wisconsin will understand that there are unifying themes: systems, order, organization, and interactions; evidence, models, and explanations; constancy, change, and measurement; evolution, equilibrium, and energy; form and function among scientific disciplines.
- Students in Wisconsin will understand that science is ongoing and inventive, and that scientific understandings have changed over time as new evidence is found.
- Students in Wisconsin will investigate questions using scientific methods and tools, revise their personal understanding to accommodate knowledge, and communicate these understandings to others.
- Students in Wisconsin will demonstrate an understanding of the physical and chemical properties of matter, the forms and properties of energy, and the ways in which matter and energy interact.
- Students in Wisconsin will demonstrate an understanding of the structure and systems of Earth and other bodies in the universe and of their interactions.
- Students in Wisconsin will demonstrate an understanding of the characteristics and structures of living things, the processes of life, and how living things interact with one another and their environment.
- Students in Wisconsin will demonstrate an understanding of the relationship between science and technology and the ways in which that relationship influences human activities.
- Students in Wisconsin will use scientific information and skills to make decisions about themselves, Wisconsin, and the world in which they live.

Performance Standards can be found at:
http://dpi.wi.gov/standards/sciintro.html

Social Studies
Content Standards
- Students in Wisconsin will gain geographical perspectives on the world by studying the Earth and the interactions of people with places where they live, work, and play. Knowledge of geography helps students to address the various cultural, economic, social, and civic implications of life in Earth's many environments.
- Students in Wisconsin will learn about the history of Wisconsin, the United States, and the world, examining change and continuity over time in order to develop historical perspective, explain historical relationships, and analyze issues that affect the present and the future.

- Students in Wisconsin will learn about political science and acquire the knowledge of political systems necessary for developing individual civic responsibility by studying the history and contemporary uses of power, authority, and governance.
- Students in Wisconsin will learn about production, distribution, exchange, and consumption so that they can make informed economic decisions.
- Students in Wisconsin will learn about the behavioral sciences by exploring concepts from the discipline of sociology, the study of the interactions among individuals, groups, and institutions; the discipline of psychology, the study of factors that influence individual identity and learning; and the discipline of anthropology, the study of cultures in various times and settings.

Performance Standards can be found at:
http://dpi.wi.gov/standards/ssintro.html

Endnotes

1. Wisconsin Department of Public Instruction. Wisconsin Model Academic Standards for Science. 1998.

2. Miller, G. T. Living in the Environment. 2007. Thomson Learning.

3. Wisconsin Environmental Education Board. 2008. http://www.uwsp.edu/cnr/weeb/.

4. The College Board. College Board AP Environmental Science Course Description. 2007.

5. Learn and Serve: America's National Service Learning Clearinghouse. 2008. http://www.servicelearning.org.

6. United Nations. Report of the World Commission on Environment and Development. General Assembly Resolution 42/187, 11 December 1987.

7. Engleson, D. & Yockers, D. A Guide to Curriculum Planning in Environmental Education. 1994. Wisconsin Department of Public Instruction.

Feedback

This document is dynamic and will evolve with changes in the science and environmental communities, trends in education, and teacher needs. Feedback from educators and scientists about the document is necessary and valuable. Your comments related to content and use of the document are welcome.

Please share your feedback about the *Wisconsin Environmental Science Course Framework* using one of the methods below. Reference this version of the framework as First Printing, 2008. For specific comments, please include page numbers and clearly identify the section you are referencing.

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