

Environmental Science Science Curriculum Framework

Revised 2005

Course Title: Environmental Science
 Course/Unit Credit: 1
 Teacher Licensure: Physical/Earth Science
 Grades: 9-12

Environmental science should examine the physical and biological dynamics of Earth. Students should analyze the impact of human activities on the environment. Field studies, as well as the process of collecting and analyzing data, should be an integral part of the course. Instruction and assessment should include both appropriate technology and the safe use of laboratory equipment. Students should be engaged in hands-on laboratory experiences at least 20% of the instructional time.

Strand	Standard
Physical Dynamics	
	1. Students shall understand the physical dynamics of Earth.
Biological Dynamics	
	2. Students shall understand the biological dynamics of Earth.
Social Perspectives	
	3. Students shall understand the impact of human activities on the environment.
Nature of Science	
	4. Students shall use mathematics, science equipment, and technology as tools to communicate and solve environmental science problems.
	5. Students shall describe the connections between pure and applied science.
	6. Students shall describe the various environmental careers and the training required for the selected career.

Strand: Physical Dynamics

Standard 1: Students shall understand the physical dynamics of Earth

PD.1.ES.1	Describe the structure, origin, and evolution of the Earth's components: <ul style="list-style-type: none"> • atmosphere • biosphere • hydrosphere • lithosphere
PD.1.ES.2	Relate eras, epochs, and periods of Earth's history to geological development
PD.1.ES.3	Determine the relative and absolute ages of rock layers
PD.1.ES.4	Categorize the type and composition of various minerals
PD.1.ES.5	Explain the processes of the rock cycle
PD.1.ES.6	Describe the processes of degradation by weathering and erosion
PD.1.ES.7	Describe tectonic forces relating to internal energy production and convection currents
PD.1.ES.8	Describe the relationships of degradation (a general lowering of the earth's surface by erosion or weathering) and tectonic forces: <ul style="list-style-type: none"> • volcanoes • earthquakes
PD.1.ES.9	Construct and interpret information on topographic maps
PD.1.ES.10	Describe the characteristics of each of the natural divisions of Arkansas: <ul style="list-style-type: none"> • Ozark Plateau • Arkansas River Valley • Ouachita Mountains • Coastal Plain • Mississippi Alluvial Plain (Delta) • Crowley's Ridge
PD.1.ES.11	Describe the physical and chemical properties of water
PD.1.ES.12	Compare and contrast characteristics of the oceans: <ul style="list-style-type: none"> • composition • physical features of the ocean floor • life within the ocean • lateral and vertical motion
PD.1.ES.13	Investigate the evolution of the ocean floor
PD.1.ES.14	Investigate the stratification of the ocean: <ul style="list-style-type: none"> • <i>colligative</i> properties (depends on the ratio of the number of particles of solute and solvent in the solution, not the identity of the solute) • biological zonation (distribution of organisms in biogeographic zones)
PD.1.ES.15	Predict the effects of ocean currents on climate

Strand: Physical Dynamics

Standard 1: Students shall understand the physical dynamics of Earth.

PD.1.ES.16	Explain heat transfer in the atmosphere and its relationship to meteorological processes: <ul style="list-style-type: none">• pressure• winds• evaporation• precipitation
PD.1.ES.17	Compare and contrast meteorological processes related to air masses, weather systems, and forecasting
PD.1.ES.18	Construct and interpret weather maps
PD.1.ES.19	Describe the cycling of materials and energy: <ul style="list-style-type: none">• nitrogen• oxygen• carbon• phosphorous• hydrological• sulfur

Strand: Biological Dynamics

Standard 2: Students shall understand the biological dynamics of Earth

BD.2.ES.1	Compare and contrast biomes
BD.2.ES.2	Describe relationships within a community: <ul style="list-style-type: none">• predation• competition• parasitism• mutualism• commensalism
BD.2.ES.3	Differentiate between primary and secondary succession
BD.2.ES.4	Construct a trophic-level pyramid (energy level)
BD.2.ES.5	Construct a food chain
BD.2.ES.6	Diagram a food web
BD.2.ES.7	Compare and contrast food webs and food chains
BD.2.ES.8	Describe biodiversity
BD.2.ES.9	Explain how limiting factors affect populations and ecosystems
BD.2.ES.10	Describe the natural selection process in populations

Strand: Social Perspectives

Standard 3: Students shall understand the impact of human activities on the environment.

SP.3.ES.1	Explain the reciprocal relationships between Earth's processes (natural disasters) and human activities
SP.3.ES.2	Investigate the relationships between human consumption of natural resources and the stewardship responsibility for reclamations including disposal of hazardous and non-hazardous waste
SP.3.ES.3	Explain common problems related to water quality: <ul style="list-style-type: none"> • conservation • usage • supply • treatment • pollutants (point and non-point sources)
SP.3.ES.4	Explain problems related to air quality: <ul style="list-style-type: none"> • automobiles • industry • natural emissions
SP.3.ES.5	Evaluate the impact of different points of view on health, population, resource, and environmental issues: <ul style="list-style-type: none"> • governmental • economic • societal
SP.3.ES.6	Research how political systems influence environmental decisions
SP.3.ES.7	Investigate which federal and state agencies have responsibility for environmental monitoring and action
SP.3.ES.8	Compare and contrast man-made environments and natural environments
SP.3.ES.9	Evaluate personal and societal benefits when examining health, population, resource, and environmental issues
SP.3.ES.10	Predict the long-term societal impact of specific health, population, resource, and environmental issues
SP.3.ES.11	Investigate the effect of public policy decisions on health, population, resource, and environmental issues
SP.3.ES.12	Explain the impact of factors such as birth rate, death rate, and migration rate on population changes
SP.3.ES.13	Distinguish between developed and developing countries

Strand: Nature of Science

Standard 4: Students shall use mathematics, science equipment, and technology as tools to communicate and solve environmental science problems.

NS.4.ES.1	Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
NS.4.ES.2	Use appropriate equipment and technology as tools for solving problems (e.g., microscopes, centrifuges, flexible arm cameras, computer software and hardware)
NS.4.ES.3	Utilize technology to communicate research findings

Strand: Nature of Science

Standard 5: Students shall describe the connections between pure and applied science.

NS.5.ES.1	Compare and contrast environmental concepts in pure science and applied science
NS.5.ES.2	Explain why scientists should work within ethical parameters
NS.5.ES.3	Evaluate long-range plans concerning resource use and by-product disposal for environmental, economical and political impact
NS.5.ES.4	Explain how the cyclical relationship between science and technology results in reciprocal advancements in science and technology

Strand: Nature of Science

Standard 6: Students shall describe various environmental science careers and the training required for the selected career.

NS.6.ES.1	Research and evaluate science careers using the following criteria <ul style="list-style-type: none">▪ educational requirements▪ salary▪ availability of jobs▪ working conditions
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Appendix

Suggested Environmental Science Labs

Strand	Suggested Labs
Physical Dynamics	soil lab (ph levels of soil samples) Thermal Pollution Lab
Biological Dynamics	air quality lab ecological succession lab food web lab population lab (identify common plants and animals found in Arkansas using dichotomous keys) quadrant lab waste-water treatment lab water quality lab