Environmental Science

Overview

The standards establish the scientific inquiry skills and core content for all courses in DoDEA schools. The Environmental Science course of study provides students with a basic knowledge of the natural world that will serve as the foundation for more advanced secondary and postsecondary courses and will also give them the science skills necessary for environmental science oriented technical careers. Environmental Science takes a holistic look at the laws of matter and energy, ecosystem analysis, population dynamics, renewable and nonrenewable resources, and human impact on the environment. Investigations are centered on complex topics such as ecology, evolution and consistency and equilibrium. In-depth understanding of these concepts requires students to apply knowledge from other scientific disciplines, such as earth science, physics, chemistry, and biology.

All DoDEA science courses are laboratory courses (minimum of 30 percent hands-on investigation). Environmental Science laboratories will need to be stocked with all of the materials and apparatuses necessary to complete investigations. Instructional activities are staged in appropriate settings. They include laboratories, classrooms, forms of technology, and field studies. Teaching strategies include in depth laboratory investigations, demonstrations, collaborative peer-to-peer discussions, and student hands-on field experiences. All aspects of progress in science are measured using multiple methods such as authentic assessments, performance assessments, formative assessments, observational assessments, projects, research activities, reports, group and individual student work and conventional summative assessments.

Scientific Inquiry

The skills of scientific inquiry, including knowledge and use of tools, are not taught as separate skills in science, but are embedded throughout because these process skills are fundamental to all science instruction and content. A table of the PK–12 of scientific inquiry standards and Indicators: is provided in appendix A.

Standard	**Ea:**	**The student will demonstrate an understanding of how scientific inquiry and technological design, including mathematical analysis, can be used appropriately to pose questions, seek answers, and develop solutions.**
Indicators	**Ea.1:**	Generate hypotheses based on credible, accurate, and relevant sources of scientific information.
	Ea.2:	Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
	Ea.3:	Use scientific instruments to record measurement data in appropriate metric units that reflect the precision and accuracy of each particular instrument.
	Ea.4:	Design a scientific investigation with appropriate methods of control to test a hypothesis (including independent and dependent variables), and evaluate the designs of sample investigations.
	Ea.5:	Organize and interpret the data from a controlled scientific investigation by using mathematics, graphs, models, and/or technology.
	Ea.6:	Evaluate the results of a controlled scientific investigation in terms of whether they refute or verify the hypothesis.
	Ea.7:	Evaluate a technological design or product on the basis of designated criteria (including cost, time, and materials).
	Ea.8:	Compare the processes of scientific investigation and technological design.
	Ea.9:	Use appropriate safety procedures when conducting investigations**.**
Standard	**Eb:**	**The student will identify and describe current environmental issues, and considers of the role of beliefs, attitudes, and values in proposing solutions to environmental problems.**
Indicators	**Eb.1:**	Utilize research methods to investigate environmental questions, reevaluates their personal beliefs to accommodate new knowledge and perspectives, and is able to effectively communicate this understanding to others.
	Eb.2:	Evaluate the advantages and disadvantages of balancing short term interests with long term welfare of the society.
	Eb.3:	Explain how individual activities and decisions can have an impact on the environment.
	Eb.4:	Identify a variety of approaches to environmental issues and evaluates the benefits and consequences of each from a social, economic, and ecological standpoint.

	Eb.5:	Evaluating the ways in which government can influence environmental policy.
	Eb.6:	Identify how the choices individuals make affect the environment.
Standard	**Ec:**	**The student will identify the effect of human activities on natural processes and interrelationships within ecosystems.**
Indicators	**Ec.1:**	Provide evidence for how human population growth has impacted the environment and the use of natural resources.
	Ec.2:	Describe the ways in which the use of technology has an affected the environment and standard of living.
	Ec.3:	Provide evidence for how people impact their environment through the use of natural resources.
	Ec.4:	Recognize the ways in which technology, while improving our standard of living, has increased the human impact on the environment.
	Ec.5:	Evaluate a variety of land management practices on their ability to restore ecosystem functioning and trophic relationships.
	Ec.6:	Describe how people affect biodiversity through land use practices, pollution, and their use of organisms.
	Ec.7:	Identify the effects of human activities on ecosystems at various scales in terms of ecosystem functioning.
	Ec.8:	Assess the environmental and societal costs and benefits of various common natural resource management strategies.
Standard	**Ed:**	**The student will identify a variety of Earth's finite natural resources, assess the availability and sustainability of resources.**
Indicators	**Ed.1:**	Explain how fossil fuels are formed and where they can be found.
	Ed.2:	Illustrate the naturally occurring cycles of Earth's finite resources through Earth's four major systems (atmosphere, hydrosphere, lithosphere, and biosphere) by describing the path of an element or a molecule in a natural resource (for example carbon or water).
	Ed.3:	Recognize that certain resources are nonrenewable because they are replenished at timescales of thousands to millions of years.
	Ed.4:	Interpret how changes to the availability of nonrenewable natural resources might affect society (considering, for example, manufacturing industries, agriculture, and transportation).
	Ed.5:	Analyze the future availability of nonrenewable energy resources considering the trend of human consumption of energy.
	Ed.6:	Infer the effects of natural and human-caused activities that either contribute to or challenge an ecologically sustainable environment.
	Ed.7:	Hypothesize the use of renewable energies and the development of superior

technologies impact upon the rate of depletion of natural resources.

Ed.8: Explain the ways in which individuals can alter their own behavior to reduce the human carbon footprint.

Ed.9: Summarize how changes in the availability of energy will affect society and human activities, such as transportation, agricultural systems, and manufacturing.

Standards Ee: The student will explain how geochemical cycles and ecological processes on Earth interact through time to cycle matter and energy and how human activity can alter the rates of these processes.

Ee.1: Generate examples of the Earth as a complex system with connected and interconnected components and processes.

Ee.2: Organize the multiple pathways of carbon movement between reservoirs.

Ee.3: Organize evidence that Earth is a system containing essentially a fixed amount of each stable chemical atom or element which moves among reservoirs in the solid Earth, oceans, atmosphere, and organisms as part of geochemical cycles.

Ee.4: Generate predictive hypotheses predicting the effects of carbon dioxide on Earth's systems.

Standards Ef: The student will analyze ecology as interrelationships, explain the transfer of matter and energy within ecosystems, relate the theory of biological evolution to geologic time and addresses speciation and biodiversity in the context of the environment.

Ef.1: Describe the ways in which biodiversity is important to ecosystems and human society.

Ef.2: Assess the potential value of a single species to a particular ecosystem.

Ef.3: Explain how organisms are adapted to the environment in terms of ecological niches and natural selection.

Ef.4: Relate the importance of genetic diversity and population size to the conservation of a species.

Ef.5: Identify the factors that have contributed to the growth of the human population and examine the impact this growth will have on the environment.

Ef.6: Differentiate that the Earth's systems exist in a state of dynamic equilibrium and that certain compositions of the Earth's system(s) may fluctuate on short or long time scales but the Earth's system will generally stay within a certain narrow range for millions of years.

Ef.7: Recall the natural processes of change in the environment, including examples of succession, evolution, and extinction.

Ef.8: Identify factors that influence patterns of ecological succession, including invasive species, loss of biodiversity, change in abiotic conditions, and catastrophic events.

Ef.9: Identify the factors limiting population growth in a given area (carrying capacity).