



BAKER COLLEGE

STUDENT LEARNING OUTCOMES

SCI4510 Environmental Science
3 Semester Hours

Student Learning Outcomes and Enabling Objectives

1. Apply scientific practices and identify aspects of nature of science.
 - a. Apply the principles of scientific investigation within the context of a physical or natural science.
 - i. Identify a valid scientific argument (e.g., recognizing when scientific evidence supports a hypothesis).
 - ii. Conduct an effective literature search (e.g. Evaluate the validity of sources (e.g., websites, peer reviewed journals) and distinguish between types of sources)
 - iii. Evaluate the use and misuse of scientific information (e.g Recognize a valid scientific course of action, distinguish the appropriate use of science to make societal decisions).
 - iv. Read and interpret graphical representations of data.
 - v. Justify inferences, predictions, and conclusions based on quantitative data.
 - b. Identify aspects of the nature of science.
 - i. Recognize that science is tentative.
 - ii. Recognize that science is subjective.
 - iii. Recognize that science is social.
 - iv. Recognize that science is empirical.
2. Discuss federal and state environmental agencies and policies.
 - a. Differentiate between the following federal regulatory agencies.
 - i. OSHA (Occupational Safety and Health Association)
 - ii. EPA (Environmental Protection Agency)
 - iii. FDA (Food and Drug Administration)
 - b. Identify state level regulatory agencies.
 - c. Identify and describe the following major environmental laws.
 - i. Endangered Species Act
 - ii. Clean Water Act
 - iii. Clean Air Act
 - iv. Soil Conservation Act
 - v. Superfund Act
 - d. Describe the steps involved in developing environmental policy and how it changes over time.
 - e. Identify potential stakeholders in environmental issues and how stakeholders contribute to developing environmental policy.
3. Examine ecological concepts.
 - a. Describe ecosystems.

- i. Define ecosystem.
 - ii. Identify that the source of energy for most ecosystems is the sun.
 - iii. Explain how energy flows through ecosystems.
 - iv. Identify that energy is lost at each trophic level.
 - v. Define nutrient cycling.
 - vi. Identify that ecosystems change over time.
 - vii. Define invasive species.
 - b. Explain evolution.
 - i. Define population.
 - ii. Describe species concept.
 - iii. Define niche.
 - iv. Define extinction.
 - v. Define evolution.
 - vi. Describe the development of the theory of natural selection.
 - c. Assess the characteristic climate and biological factors that determine ecological biomes.
 - i. Recognize the relationship between temperature and precipitation in determining biomes.
 - ii. Define biodiversity.
 - iii. Evaluate how human activities, such as the ones listed below, impact biomes and biodiversity.
 1. Habitat destruction and fragmentation
 2. Overhunting and overfishing
 3. Farming
 4. Commercial use of species
 5. Predator and pest control
 6. The introduction of exotic species
 7. Human population growth
4. Assess the past, current, and future states of the environment.
 - a. Describe sources of pollution.
 - i. Identify the difference between natural sources and anthropogenic sources of pollution.
 - ii. List examples of natural and anthropogenic sources of pollution, such as:
 1. Natural sources: erosion, volcanic eruptions, and forest fires
 2. Anthropogenic sources: mining, industrial, agricultural, and urban
 - b. Describe air pollution.
 - i. Identify the sources and environmental impacts related to the 'criteria' air pollutants, such as:
 1. Ground-level ozone
 2. Particulate matter
 3. Carbon monoxide
 4. Lead
 5. Sulfur dioxide
 6. Nitrogen dioxide

- ii. Identify the sources and implications of indoor air pollution.
- c. Describe how the following factors relate to climate.
 - i. The greenhouse effect
 - ii. Jet streams
 - iii. Ocean currents
- d. Describe human-caused global climate change (global warming).
 - i. Discuss the evidence of climate change and its causes.
 - ii. Identify the primary greenhouse gases, including those listed below, that contribute to global warming and their sources.
 - 1. Carbon dioxide
 - 2. Methane
 - iii. Describe the impacts of climate change, such as:
 - 1. Rising sea levels
 - 2. Ocean acidification
 - 3. Precipitation patterns
 - 4. Increased temperature
 - 5. Change in storm activity and intensity
- e. Discuss Water Pollution.
 - i. Identify the reservoirs of water, such as those listed below, through the hydrological system.
 - 1. Groundwater
 - 2. Rivers
 - 3. Lakes
 - 4. Wetlands
 - 5. Oceans
 - ii. Describe how water moves through a given hydrological system.
 - iii. Describe the different ways in which humans use water including:
 - 1. Municipal
 - 2. Agricultural
 - 3. Industrial
 - iv. Describe methods of water management and conservation, including:
 - 1. Waste water treatment
 - 2. Residential water conservation
 - 3. Agricultural water conservation
 - 4. Industrial water conservation
 - v. Contrast point sources and nonpoint sources of water pollution using various types of pollution, such as:
 - 1. Pathogens
 - 2. Inorganic chemicals
 - 3. Organic chemicals
 - 4. Thermal sources of pollution
 - 5. Endocrine disrupting pollutants
- f. Describe geologic processes.
 - i. Explain how geological processes, such as the ones listed below, impact human populations.

1. Flooding
 2. Erosion
 3. Volcanos
 4. Earthquakes
 - ii. Explain the environmental impacts of resource extraction, such as:
 1. Flooding
 2. Erosion
 3. Pollution
 4. Stripping of ecological resources
 - g. Discuss sources of energy and their impacts on the environment.
 - i. Compare the different energy sources, such as:
 1. Fossil fuels
 - a. Coal
 - b. Oil
 - c. Natural gas
 2. Wind
 3. Hydroelectric
 4. Solar
 5. Biofuels
 6. Nuclear
 7. Geothermal
 8. Experimental energy technologies.
 - ii. Describe methods of energy conservation.
 - iii. Describe how industries and individuals can mitigate the impacts of energy use, such as:
 1. Carbon sequestration
 2. Improving efficiency
 3. Cap and trade
5. Assess environmental health hazards.
 - a. Identify potential environmental health hazards, such as:
 - i. Emergent diseases
 - ii. Pesticides
 - iii. Antibiotic resistance
 - iv. Toxic chemicals
 - b. Analyze the movement, distribution, and fate of toxins in the environment, such as:
 - i. Solubility
 - ii. Bioaccumulation
 - iii. Biomagnification
 - iv. Persistence
 - v. Measurement of toxicity
 - c. Explain risk assessment hazards.
 - i. Describe methods of exposure.
 - ii. Explain potential health consequences.
 - iii. Explain acceptable risk as determined by state and federal health agencies.
 6. Explain sustainability and conservation.

- a. Explain the shifting baseline and how environmental damage is incremental.
 - b. Recognize the importance of collaboration and partnerships in conservation.
 - c. Describe how solid and hazardous waste is managed, such as:
 - i. Recycling
 - ii. Conservation
 - d. Describe proper land use and conservation methods, such as:
 - i. Forest harvesting
 - ii. Rangeland management
 - iii. Parks and nature preserves
 - iv. Agricultural use
 - v. Land degradation
 - e. Interpret the concept of sustainability in relation to the following:
 - i. Increasing human population
 - ii. Managing resources
 - iii. Ecological economics
 - iv. Long term medical costs due to environmental health effects
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These SLOs are approved for experiential credit.

Effective: Fall 2017