Environmental Science Course Syllabus

Course Description:

This course examines environmental science and the concept of sustainability from scientific, personal, and philosophical perspectives. Students learn the science behind different energy resources, myriad types of pollution and their effects on the environment and human health, climate change, natural resource use and management, conservation and land use, and sustainable agriculture. While the scientific aspect forms the core of the course, it is complemented by discussion of relevant environmental laws and environmental economics, as well as discussion of personal sustainability practices and consideration of one's carbon footprint, waste production patterns, and energy use. Finally, the course is rounded out with an overview of environmental ethics and related philosophical paradigms, as well as strategies for a sustainable future.

5 credit hours (Part 2)

California Science Standards: HS-LS2-7, HS-ESS2-2, HS-ESS2-4, HS-ESS3-1, HS-ESS3-2, HS-ESS3-4

California Common Core State Standards Connections: ELA/Literacy – RST.11-12.1, RST.11-12.7, WHST.9–12.2.a–e , WHST.9–12.7, SL.11-12.4

Science and Engineering Practices: Analyzing and Interpreting Data, Constructing Explanations and Designing Solutions, Engaging in Argument from Evidence, Planning and Carrying Out Investigations

Course Outline

Unit 1: Agriculture and Land Use

1.1 Evolution of Agriculture Over Time

1.2Fertilizer and The Green Revolution

1.3 Soils and Soil Health

1.4 Growing Fuel

1.5 Deforestation

1.6 Biodiversity

1.7 Tragedy of the Commons

1.8 Over-fishing

1.9 Urban Sprawl

Unit 2: Food and Agricultural Sustainability

2.1 Sustainable Agriculture

California Standards

In Unit 1 students will learn:

About the evolution of agriculture over time, fertilizer and Norman Borlaug's Green Revolution in agriculture, and relevant topics in soil health and biodiversity.

Major land-use issues and their effects on ecosystems and the climate are discussed, including using land for growing biofuel, deforestation, over-fishing, and urban sprawl.

The philosophical/economic idea of the Tragedy of the Commons.

In Unit 2 students will learn:

2.2 Organic, Free Range, and Grass fed

2.3 Fair Trade Products

2.4 Farmers Markets and Community Supported Agriculture

2.5 Meats and the Environment

2.6 Permaculture

2.7 Community Gardens

2.8 Native and Food Forest Gardens

2.9 Hydropower and Tidal Power

2.10 Hydrogen Fuel Cells

The multifaceted concept of "sustainable agriculture" as well as the connection between cattle farming and greenhouse gas production.

Many different strategies that farmers, communities, and consumers adopt in an attempt to make their food consumption or agricultural operation more environmentally-friendly. Such strategies include: organic, free-range and grass-fed products, Fair Trade products, farmers' markets and community supported agriculture (CSA), permaculture, community gardens, native gardens, and food forest gardens.

Unit 3: Hazardous Waste and Plastic Pollution

3.1 Landfills and Plastic Pollution

3.2 Avoiding Waste

3.3 Recycling

3.4 Upcycling and Reuse

3.5 Electronic Waste

3.6 Disposing of Old Cars and Used Motor Oil

3.7 Disposing of and Alternatives to Harmful Chemicals and Cleaners

3.8 Disposing of Old Medicines

3.9 Cleaning up Plastic Pollution

In Unit 3 students will learn:

About the production of waste, where it goes, and strategies for disposing of waste on both societal and individual scales.

What individuals should do with certain types of hazardous waste, and teaches how to properly dispose of the following (as well as the effects it has on the environment if they dispose of it incorrectly): old cars, used motor oil, harmful chemicals and cleaners, and old medicines.

Unit 4: Ecology, Economics, and Governance

4.1 Population and Carrying Capacity

4.2 Environmental Economics

4.3 The Growth Economy

4.4 The Triple Bottom Line

4.5 Cost-Benefit Analysis and Externalities

4.6 Natural Capital and Ecosystem Valuation

In Unit 4 students will learn:

Ecological principles related to consumption, growth, and environmental economics. Principles of environmental economics that are discussed include the basics of what environmental economics is, the triple bottom line, cost-benefit analysis, externalities, natural capital and ecosystem valuation, carbon pricing (cap-and-trade systems and carbon taxes), as well as how the concept of the "growth economy" relates to the idea of sustainability.

4.7 Carbon Pricing: Cap and Trade Systems, Carbon Taxes

4.8 Sustainable Development

4.9 Types of Conversation and Preservation

Relevant ecological issues discussed here include population growth and Earth's carrying capacity, as well as the contrast of conservation versus preservation.

A relevant governance concept discussed in this unit is the idea of sustainable development.

Unit 5: Environmental Ethics and Philosophy

5.1 Corporate Social and Environmental Responsibility

5.2 Environmental Value Systems

5.3 The Resource Conservation Ethic and the Land Ethic

5.4 Bioregionalism

5.5 The Rights of Nature

5.6 Environmental Justice

5.7 The Gaia Hypothesis

In Unit 5 students will learn:

About corporate social and environmental responsibility, environmental value systems (technocentrism, ecocentrism, anthropocentrism), Gifford Pinchot's Resource Conservation Ethic versus Aldo Leopold's Land Ethic, bioregionalism, the legal rights of nature, environmental justice, and chemist James Lovelock's Gaia Hypothesis.

Unit 6: Strategies for a Sustainable Future

6.1 Biomimicry

6.2 Transition Towns

6.3 Ecovillages and Ecocities

6.4 Green Technology

6.5 Geoengineering

6.6 Climate Change Mitigation and Adaption

In Unit 6 students will learn:

Some strategies that regions and societies are adopting to deal with climate change and other environmental issues.

Strategies discussed include: biomimicry in products and architecture; transition towns, ecovillages and ecocities as ways of making towns and cities more sustainable; green technology; geoengineering and other means of climate change mitigation; and climate change adaptation