Anne Fenton

A.P. EnvironmentalScience

GENERAL COURSE DESCRIPTION

The AP Environmental Science course isdesigned to be the equivalent of a one-semester college course in thestudy of human's impact on the natural world, and the relatedcultural and social context of environmental problems.

The pre-requisitesfor this course are Biology 1, Chemistry 1, and Algebra 1. Thecompletion of an Earth Science course is also recommended by notrequired. The course is taught in a science classroom, withlaboratory setups (work benches, water, laboratory glassware, etc.)and classroom computers.

The philosophy ofthe course is to expose the students to environmental concepts thatare impacting them. In addition, students will be provided withresources and information on how to make a difference in their liveswith respect to their impact on the Earth's natural systems.

TEXTBOOK AND SUPPLEMENTARY MATERIALS

Primary: Living in the Environmentby G. Tyler Miller. 12th edition

Published in 2002 by ThompsonBrooks/Cole, U.S.

Supplementary: Students will be given various articles fromnewspapers, scientific journals, and internet resources throughoutthe year-long course. In addition, science curriculum videos will besued to supplement classroom and textbook resources.

SYLLABUS – UNITS OF STUDY

I. Introduction to APES (2 classes)

Topics: Discussion of important environmental issuesand concepts.

Labs:

> •**Ecological Footprint**
>
>> •Virtual – internet based
>>
>> •Goals/Purpose: The purpose of the internet lab is to determine the student's ecological footprint and compare it to national and international footprints.

II. PopulationIssues/Population Dynamics (8 classes)

Topics:

> 1.Population ecology; carrying capacity; reproductive strategies; survivorship
>
> 2.Human Population dynamics and case studies; national policies; impacts of population growth

Labs:

    •**Population Age Structures Diagrams** (1.5 classes)

        •Student calculations

        •Goals/Purpose: The student will calculate the age structure for various countries using U.S Census Bureau data. To compare population demographics between various developed and developing countries.

    •**Plotting Growth Rates** (1 class)

        •Student calculations

        •Goals/Purpose: To plot various population growth rates. To evaluate impacts of slight changes in growth rates on populations.

    •**Species competition** (0.5 class)

        •Student hands-on

        •Goals/Purpose: To simulate and evaluate inter- and intra-species competition among species by means of different mouth structures.

III. The LivingWorld (Ecology/Energy) (9 classes)

Topics:

    1.Biological populations and communities; ecological niches; interactions among species; species diversity and edge effects; major terrestrial and aquatic biomes.

    2.Energy flow, food webs and trophic levels; ecological pyramids.

    3.Ecosystem Diversity: natural selection; evolution; ecosystem services.

    4.Natural Biogeochemical Cycles.

Labs:

    •**Biodiversity field analysis** (2 classes)

        •Student hands-on/field

        •Goals/Purpose: To evaluate the community of organisms living in an ecosystem by assessing the species diversity of a plot of land. To assess an ecosystem's health through analysis of such factors as species diversity, species richness, and relative abundance. This lab will be conducted twice during the course of the year to evaluate communities in two different seasons.

IV. WaterResources/Pollution (8 classes)

Topics:

    1.Global Water Resources: Freshwater and saltwater; ocean circulation; agricultural, industrial

and domestic use; surface and groundwater issues.

2.Water Pollution sources, causes and effects; water purification; sewage treatment/septic systems; Clean Water Act and other laws.

Labs:

- **Water quality lab** (1.5 class periods)

    •Student hands-on

    •Goals/Purpose: The purpose of the water quality lab is to expose the student to water testing equipment and procedures. The student will conduct the water testing to determine the water quality of a local stream. The student will compare water results to USEPA standards.

- **Water Use Survey** (1 class period)

    •Student hands-on

    •Goals/Purpose: The purpose of the water usage lab is to gather data on the volumes of water consumed by the student and the student's household. The student will calculate average water usage and compare the results to national and international standards.

- **Chesapeake Bay Case Study** (1.5 class periods)

    •Virtual – internet based

    •Goals/Purpose: The purpose of the lab is to analyze water quality data of several local tributaries of the Chesapeake in order to determine impact of human activities on the Chesapeake Bay. In addition, students will evaluate and interpret maps and graphs to assist with evaluation of the "State of the Bay".

- **Water filtration/treatment** (1 class)

    •Student hands-on

    •Goals/Purpose: To evaluate water filtration processes.

V. SoilFormation, Agriculture, Mining (7 classes)

Topics:

1.Earth Science Concepts; Plate tectonics, Solar intensity and latitude

2.Soil and Soil Dynamics and formation; erosion and other soil problems; soil conservation.

3.Mining formation, extraction and global reserves; relevant laws and treaties.

4.Agriculture: Feeding a growing population; human nutritional requirements; sustainable agriculture.

5.Controlling pests: Type of pesticides; costs/benefits of pesticide use; integrated pest management (IPM); relevant laws.

Labs:

>   •**Brave New World of Food** (2 class periods)

•Student calculations

•Goals/Purpose: The purpose of the lab is to have students analyze the differences between grain and meat-base diets. The students will calculate inputs necessary for both scenarios and the students will compare and contrast the differences.

VI. EnergyResources and Consumption (9 classes)

Topics:

>   1.Energy types: renewable and non-renewable; formation of energy resources; environmental advantages/disadvantages of energy resources.

>   2.Energy Consumption: History of energy usage; Present and future global energy use.

>   3.Energy conservation and efficiency: vehicles and structures.

Labs:

>   •**Energy Usage** (1-2 classes)

•Student hands-on calculations/internet

•Goals/Purpose: The purpose of the lab is to gather data on the energy usage of the student's household and compare the results to national and international averages. The students will also evaluate energy conservation practices.

>   •**Non-renewable and Alternative Energy Vehicles** (2 classes)

>   •Student calculations/internet

>   •Goals/Purpose: The purpose of the lab is to determine the fuel efficiency of the student's vehicles and evaluate quantities of air pollutants generated by combustion engines. The students will also research/present projects on alternative fuel vehicles.

VII. Urbanization/Global Economics (6 classes)

Topics:

>   >   1.Urban land development: Planned development; suburban sprawl; urbanization.

>   >   2.Transportation infrastructure.

>   >   3.Noise pollution: Sources; effects; and control measures.

>   >   4.Solid Waste Types: disposal; and reduction of waste.

>   >   5.Public and federal lands management; wilderness areas; national parks; wildlife refuges; forests; conservation and preservation of wetlands.

F. Global Economies and Globalization.

Labs:

•**Household Waste Generation** (1.5 classes)

   •Student hands-on/calculations/internet

   •Goals/Purpose: The purpose of the lab is to gather data on the waste generation of the student's household and compare the results to national averages. The students will evaluate waste conservation practices.

•**Packaging** (1 class)

   •Student calculations/internet

   •Goals/Purpose: The purpose of the lab is for the student to calculate the volumes of waste generated by various packaging scenarios.

•**Groundwater Contamination** (1 class)

   •Student hands-on

   •Goals/Purpose: To observe how polluted groundwater can contaminate nearby surface water depending on the intervening soil types. To demonstrate how groundwater is stored and how it can be brought to the surface.

VIII. AirPollution (7 classes)

Topics:

   1.Earth's Atmosphere: composition, structure, atmospheric circulation, and atmosphere/ocean interactions.

   2.Air Pollution: Primary and secondary sources; major air pollutants; indoor air pollution; remediation and reductions strategies; Clean Air Act and other relevant laws.

Labs:

•**Ozone Monitoring** (1 class)

   •Student hands-on/field

   •Goals/Purpose: To determine ozone levels in and around the school. To compare these levels with acceptable standards.

•**Traffic Study (**1 class)

   •Student hands-on/filed

   •Goals/Purpose: Record vehicle type, volume of traffic, and passenger load near the school at various times of day. (May be linked with the ozone lab.)

IX. Forestry,Fishing (2 classes)

Topics:

   1.Forestry: old growth forests; forest management; national forests.

   2.Rangelands: Overgrazing; deforestation; desertification; rangeland management; federal

rangelands.

3.Fishing techniques; over fishing; aquaculture; relevant laws and treaties.

Labs:

•**Upwelling Analysis** (1 class)

•Virtual – internet based

•Goals/Purpose: The purpose of the lab is for students to evaluate oceanic data, maps, and satellite imagery of upwelling areas to determine the connection between oceanic conditions and marine productivity areas.

X. **GlobalChanges** (6 classes)**************

Topics:

1.Stratospheric Ozone Formation; causes and effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties.

2.Global Climate Change: Greenhouse gases and greenhouse effect; impact and consequences of global climate change; relevant laws and treaties.

Labs:

•**Sea Ice/Glacier Changes** (1 class)

•Virtual – internet based

•Goals/Purpose: The purpose of the lab is to evaluate satellite images and maps to determine the extent of sea ice changes throughout the years and compare the images/data to climatic data.

XI. **Environmental and Economic Impacts** (9 classes)

Topics:

1.Loss of Biodiversity: introduced species; endangered and extinct species; conservation; relevant laws and treaties.

2.Impacts: Hazards to human health – Environmental risk analysis; Hazardous chemicals in the environment; economic impacts.

3.Politics and Environmental Policy.

4.Environmental World Views, Sustainability.

Labs:

•**Biodiversity Hotspots** (1.5 classes)

•Virtual – internet based

•Goals/Purpose: The purpose of the lab is for the students to evaluate the conditions of global "Hotspots" and research socio-economic activities that have impacted these areas.

TEACHING STRATEGIES

My teaching strategy is to act as aguide, serving to point the direction in the way that I want thestudents to find out information. I believe that independent thoughtis critical – especially in an environmental science class. Theability to form independent ideas in order to think through a problem(whether it be how to complete a task or start the students thinkingabout making appropriate choices for the environment) will help thestudents determine how to maneuver in and outside the classroom. Theability to work in groups and have group interactions is also animportant part of a classroom; to give the students a comfort levelto express their opinions and to work out problems with variousinputs – some conflicting, some validating. I would like mystudents to reach correct conclusions and answers by evaluating andprocessing the resources that I provide for them – and for me notalways providing them with the answers. As I have reminded mystudents numerous times, in the environmental field there is notalways one easy answer to the problems at hand and it is importantfor the students to understand the multi–dimensional interactionsthat humans and the environment need in order to survive.