Advanced Placement Environmental Science (APES)
2019-2020 Syllabus

Bainbridge High School – Bainbridge Island, WA
Jason Uitvlugt - Teacher

Course Description:

Environmental Science is a collaborative study that investigates how humans interact with the natural world. AP Environmental Science is designed to be equivalent to a one-semester introductory college course in environmental science. The course content has been developed by university and high school level faculty to most accurately reflect material found in many introductory courses at the college level. The goal of this course is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems, both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. Environmental science is interdisciplinary; it embraces a wide variety of topics from different areas of study. The curriculum draws upon various scientific disciplines including:

- Earth Systems and Resources
- The Living World
- Population Dynamics
- Land and Water Use
- Energy Resources and Consumption
- Pollution
- Global Change

The course will consist of lab activities, data collection and analysis, group and individual projects, topic discussions, lecture discussions, video presentations, student presentations, text reading assignments and field activities. Because this course is truly interdisciplinary, students will be faced with the task of thinking and problem solving on many levels. APES differs significantly from the usual high school course with respect to the kind of textbook used, range and depth of topics covered, the kind of laboratory work done, and the time and effort required of students. The six themes, which provide a foundation for the structure of the APES course, are:

1) Science is a process.
   - Science is a method of learning more about the world.
   - Science constantly changes the way we understand the world.
2) Energy conservation underlies all ecological processes.
   - Energy cannot be created; it must come from somewhere.
   - As energy flows through systems, at each step more of it becomes unusable.
3) The Earth itself is one interconnected system.
   - Natural systems change over time and space.

- Biogeochemical systems vary in ability to recover from disturbances.

4) Humans alter natural systems.
   - Humans have had an impact on the environment for millions of years.
   - Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

5) Environmental problems have a cultural and social context.
   - Understand the role of cultural, social, and economic factors is vital to the development of solutions.

6) Human survival depends on developing practices that will result in sustainable systems.
   - A suitable combination of conservation and development is required.
   - Management of common resources is essential.

Course prerequisites for APES are: successful completion of one year of a physical science (Physical Science, Physics, or Chemistry) and one biological science (Biology).

Text:

Brennan, Scott R. and Jay H. Withgott. *Environment: The Science Behind the Stories*. Fourth Edition. San Francisco, CA: Pearson Education.

Students will be required to stay current with assigned reading. We will be covering chapters 1-24 during the course of the year. This works out to about one chapter every 5-8 school days. On average, the required reading will be between 30-40 pages per week.

Websites:

Online Text and Assignments: Each student will need to create an account for the "Mastering Environmental Science" course website.

College Board Website: https://apstudent.collegeboard.org/apcourse/ap-environmental-science

Materials Needed:

A three-ring binder is mandatory for students to keep their class and reading notes and for organizing class handouts and returned work. Students may also be asked to gather materials from outside school that will aid in our lab and field investigations.

Lab and Field Investigations:

The AP Environmental Science lab and field investigations will be diverse and are listed in the course outline attached below. These activities are meant to compliment the lecture/discussion portion of the course by providing opportunities to learn about our environment through firsthand observations. On average, we will be spending one class period per week conducting lab or field work or another activity.

The AP Exam:

The course is designed to prepare students for the AP exam in addition to enriching their knowledge and understanding of the natural world. Some students may qualify for fee reductions or waivers to pay for the exam.

The date for the AP Environmental Science exam this year is: Monday, May 11, 2020 at 12:00 p.m.

Homework

May include but not be limited to:

- Reading the current unit content and answering textbook questions
- Reviewing lecture notes (from Smart Board pdfs)
- Readings and case studies
- Making and studying flash cards for unit tests and quizzes
- Lab write-ups
- Essays
- Creating posters, surveys, etc.

Chapter Vocabulary:

Students will learn approximately 700 vocabulary words related to Environmental Science. Vocabulary is very important to fully understand science. Students are encouraged to make their own flash cards.

Unit Exams and Chapter Quizzes:

Each unit will end with a multiple-choice test and a Free Response Question (an essay). The tests will be worth about 100 points each. There will be a quiz for each chapter which will cover topics from the textbook and lectures. They will be worth about 10 points each.

Attendance: Since this is an Advanced Placement class, attendance is mandatory. Every day. While you won't be graded on attendance, it will affect your ability to handle the material we are trying to get through in the school year.

Grading:

Students will be evaluated through their performance on unit exams, section quizzes, participation in lab/field investigations, lab reports, writing assignments and projects.
Approximate grade percentages are as follows:

Exams and Quizzes……..…. 50%
Investigations……...…30%
Homework/classwork……..……...….20%

The grading scale will be:

100-93%	A	92-90%	A-	89-87%	B+	86-83%	B
82-80%	B-	79-77%	C+	76-73%	C	72-70%	C-
69-67%	D+	66-63%	D	62-60%	D-		

Students may drop one **completed** assignment of their choice per semester. Extra credit is available on request.

Expectations:

Be prompt, prepared, polite and courteous to those around you. When throwing out trash and paper goods, please use the recycling bins provided in the classroom. Come to class on time. Plagiarism of any kind is unacceptable and will result in the forfeiture of points for the test/assignment and a phone call home.

Make a habit to read the board at the beginning of each period for information regarding your question, "What are we doing today?" Ask questions of me and of each other often. Most importantly, motivation will be the hardest obstacle for many of you to overcome this year; therefore, encourage each other as often as you feel comfortable with and seek out help from me, your peers or your parents if you find yourself stuck. Outside of school time, feel free to e-mail if you have questions.

General Scope and Sequence for APES:

Unit	Topic	Relevant Chapters
1	Environmental Science and Sustainability	1, 24
2	Principles of Ecology -This unit is broken into two test sections	2 and 5 3, 4, 11
3	Human Population Dynamics	8
4	Earth's Land Resources and Use -This unit is broken into two test sections	9 and 10 12, 22, 23
5	Water Resources and Pollution	15, 16
6	Atmospheric Science	17, 18
7	Energy Resources and Impacts	19, 20, 21
8	The Urban Environment and Toxicology	13, 14
9	Environmental Decision Making	6 , 7

Course Outline

Unit and Chapters (Times spent on units are approximate)	Labs(L), Activities(A), Field Experience(F) Other labs and activities may be substituted/added for those currently listed
Unit 1: Environmental Science and Sustainability **(3 weeks)** **Chapter 1:** *Science and Sustainability: An Introduction to Environmental Science* **Chapter 24:** *Sustainable Solutions*	• **(A) Tragedy of the Commons Simulation:** Students will simulate human behavior as it applies to a common property resource • **(A) An Ecological Footprint:** Students and parents determine a value on their usage of land on earth. They get the opportunity to see if they make small changes in their lifestyle how this might change their influence on earth.
Unit 2: Principles of Ecology **(6 weeks)** **Chapter 2:** *Earth's Physical Systems: Matter, Energy, and Geology* **Chapter 5:** *Environmental Systems and Ecosystem Ecology*	• **(L) Eco-Column Lab (8 week monitoring):** Students will design and construct a bio-bottle ecosystem with a terrarium and aquarium component. Students will monitor conditions within the ecosystem including pH, temperature, dissolved oxygen and observe biological responses to changes in conditions. • **(A) Geology Rocks**: Students will review the rock cycle through simulating the different parts

Chapter 3: *Evolution, Biodiversity, and Population Ecology* **Chapter 4:** *Species Interactions and Community Ecology* **Chapter 11:** *Biodiversity and Conservation Biology*	• **(A) Parking Lot Diversity Simulation**: Students will use automobiles to simulate natural species as an introduction to diversity indices. • **(L) Grass Plot Biodiversity Sampling**: Students will catalog and count grass species at various plots around the school yard using a grid and random selection method. Students will compare the diversity of grass species at different locations using the Shannon Diversity Index. • **(A) Natural Selection Simulation**: Using colored beads on a variety of backgrounds, students will use the Chi Square statistic to determine the probability of natural selection in a predator simulation. • **(A) Biome Project:** Students study one of the different biomes and develop a presentation that includes location, precipitation, temperature, plants and animals and how man has influenced the biome. • **(A) Biogeochemical Cycle Project**: Students will understand how the various biogeochemical cycles work and how other related cycles work. Using power point presentations, students will see how the core element moves through the cycle and how man is having an influence on the cycle.
Unit 3: Human Population Dynamics (2 weeks) ***Chapter 8:*** *Human Population*	• **(A)Tag/Recapture Simulation**: Using beads, students will simulate the tag and recapture method of determining the approximate size of a population without counting each individual. • **(A) Human Demographic Data Analysis**: Each student will collect demographic data from home and pool into a class set of data. Data will be used to construct age pyramids to be analyzed against age pyramids of the state and country. • **(F) Cemetery Data Field Work**: Students will collect ages of deceased at local cemeteries to develop survivorship curves for generations pre and post 1900.
Unit 4: Land Resources and Use (5 weeks) **Chapter 9:** *Soil and Agriculture* **Chapter 10:** *Agriculture, Biotechnology and the Future of Food* **Chapter 12:** *Forests, Forest Management, and Protected Areas* **Chapter 22:** *Managing our Waste* **Chapter 23:** *Minerals and Mining*	• **(A) Invasive Species Project**: Students learn how different species (plant, animal, fungus, and others) have entered the state, the damage they are causing and what is being done to reduce the negative influence of these invasive species. • **(L) Forestry and Conservation Study:** Students will construct a clinometer and measure trees to determine the number of board feet in trees and per acre. • **(L) Ecological Succession:** Students will observe plants that live in a field to compare and infer whether ecological succession is taking place. • **(L) Soils Lab:** Each student will determine the texture, porosity and permeability of a variety of soil samples taken from their neighborhoods. Students will be instructed in quantitative and qualitative methodology to determine soil type. • **(L) Salinization Lab:** Students' set-up seeds in increasing salt concentrations and determine how many have germinated through

	observations. Students will understand that fruits and vegetables cannot grow in moderately high salt concentrations. • **(A) Cookie Mining Simulation**: Students will use cookies to simulate mining operations and economics and determine viability of mining operations.
Unit 5: Water Resources and Pollution (3 weeks) **Chapter 15:** *Freshwater Systems and Resources* **Chapter 16:** *Marine and Coastal Systems and Resources*	• **(F) <u>Field Trip</u>: Lake Water Sampling**: Students will take water samples and examine levels of pH, turbidity, nitrate and phosphates at various within a local city park lake to determine how nearby land uses may contribute to lake water quality. • **(L) Brine Shrimp Bioassay**: Students will determine thresholds and the LD50 of ammonia for brine shrimp. • **(L) Water Quality Testing Inquiry Lab Activity**: Students will be given a variety of unknown water samples and will need to determine the origin of each sample based on water testing for a variety of chemical pollutants.
Unit 6: Atmospheric Science (3 weeks) **Chapter 17:** *Atmospheric Science and Air Pollution* **Chapter 18:** *Global Climate Change*	• **(F) Ozone and Particulates: Air Sampling**: Students will construct sampling strips for Ozone and collectors for particulates to qualitatively and quantitatively analyze air quality. Students will compare results from school site to on-line, local air district data. • **(L) Global Warming and Greenhouse Effects Lab:** Students will investigate the potential effects of global climate change using an in class model.
Unit 7: Energy Resources and Impacts (3 weeks) **Chapter 19:** *Fossil Fuels, Their Impacts, and Energy Conservation* **Chapter 20:** *Conventional Energy Alternatives* **Chapter 21:** *New Renewable Energy Alternatives*	• **(L) Fuels Lab Experiment**: Students will use calorimetry to compare the energy released per unit for a fossil fuel and a renewable fuel source and draw conclusions regarding the viability of alternative energy resources. • **(A) Personal Energy Use Audit**: Students will perform a variety of calculations to determine the amount of energy consumed within their households and predict how changes in personal behavior may change consumption. • **(L) Cleaning Up Oil Spills**: Students will observe the effect of a detergent on oil that has been spilled on water, and infer its effect on bird feathers. They will model a set of techniques that they think will be most effective in cleaning up an oil spill.
Unit 8: The Urban Environment (3 weeks) **Chapter 13: The Urban Environment: Creating Livable and Sustainable Cities** **Chapter 14: Environmental Health and Toxicology**	• (L) Personal Solid Waste Inventory: Students will collect a week's worth of solid waste and sort the waste as a class. Students will calculate the mass of each waste by type and determine the percentages of recyclable material within their personal waste streams. • (L) Pesticide Bioassay: Students will design and carry out a controlled experiment to determine the threshold and LC50 of a variety of herbicides on perennial plants. (F) Sewage Treatment Plant Tour: Students will visit the local sewage treatment plant and diagram the operation for a better understanding of local water quality within the local waters.
Unit 9: Environmental Decision Making (3 weeks)	• (A) Hetch-Hetchy Water Resource Debate: Students will be assigned a variety of roles and debate a classic example of competing interests in water resource allocation.

Chapter 6: Environmental Ethics and Economics: Values and Choices **Chapter 7: Environmental Policy: Decision Making and Problem Solving**	• (A) National Parks Pamphlet: Students will research a national park of their choice; construct a poster board and a pamphlet for a group presentation. • (L) Environmental Issues and Public Policy: Students will research a hypothetical situation involving hazards to the environments and the residents of a community. They will model an interested party and report findings, working together to resolve problems.