AP Biology Syllabus

Personal Philosophy

AP Biology is more than a class, it is an experience that kids have the opportunity to take part in. It's intent is meant to be an introduction to college level biology, using the eight major themes from the *AP Biology Course Description* (science as process; evolution; energy transfer; continuity and change; structure and function; regulation; interdependence; and science, technology and nature). Specifically, evolution is stressed as the underlying theme throughout the year, and current events are stressed regularly throughout the year.

Course Overview

Classes meet every day for 50 minutes, 5 days per week. In addition, students have a scheduled laboratory period for 50 minutes, once every 6 days in a 6 day rotation. This allows us to do all 12 of the labs in the *AP Lab Manual for Students*, and also allows enough time for students to do many other labs that pertain to the material that we are doing at that time. Students read and outline practically every chapter in the textbook *Biology* sixth edition by Neil Campbell and Jane Reese.

All students that take the course will take the AP Biology Exam given in May. Additionally, all students work during the third semester on an independent project. Students see that science is more than memorizing facts, and after they have worked on a portion of the project alone, they form larger groups to bring what they did individually together to accomplish a project that they present to the rest of the class. Students get to hypothesize what will happen, but beyond that they really get an opportunity to DO science. So often students want to be given the answers or material then spit the information back on a test. This is great in that they don't have all of the answers ahead of time and aren't really sure what will happen in the experiments they will do. They have to follow directions clearly, take their work seriously, and rely on others in their group to do the same, documenting their results in order to get valid results that can be shared with others in the class in a scientific forum where there is open dialogue about their results and procedures followed.

Classes consist of many different forms: from lecture, to lab, to independent work, to outlines, to online web quests, to field trips, to videos, to guest lecture series, to assessments. After working rigorously all year, the last week of class is spent going over test taking techniques, and practicing old AP Biology questions.

Course Planner

I organize the year into twelve major units of study and give a copy to the students at the beginning of the year. As you can see from the following syllabus the dates we spend on each topic is approximate, but keep in mind: **Molecules and Cells, 25%, Heredity and Evolution, 25%**, **Organisms and Populations, 50%**.

Each of the units from the syllabus incorporate the eight major themes, using them as a springboard for class discussions, lectures and projects in class. Examples are given in the following section for our Unit on DNA

Theme 1 – Science as Process – Students are involved in collecting real data in a lab at an area college.
Theme 2 – Evolution – Students use comparative biochemistry to make informed decisions about related species using DNA sample data.
Theme 3 – Energy Transfer – Students are asked to describe the energy required to sustain life and pass on genetic material from one generation to another.
Theme 4 – Continuity and Change –Students are involved in a lab simulation that focuses on Protein Synthesis and DNA replication from one generation to another.
Theme 5 – Relationship of Structure to Function – Students are able to see through simulations how the cell replicates and the nucleus houses the DNA that functions to work with the ribosomes in Protein Synthesis to maintain homeostasis in organisms.
Theme 6 – Regulation – Students study the relationships between DNA malfunction and certain diseases and the regulating mechanisms in certain genes.
Theme 7 – Interdependence in Nature – Students see that in order to maintain genetic continuity from one generation to another, and to maintain a stable population, organisms depend on each other in nature.
Theme 8 – Science, Technology and Society – Students are involved first hand with cutting edge technology involved in splicing portions of DNA and inserting them into a different organism. They see how scientists used to perform manipulative tasks, and how they now utilize super computers in such things as sequencing the human genome.

Schedule Worksheet for AP Biology

Subject Area	Chapter in Campbell	Lab	Approx. Date
Evolution	22-24	#11	Sept.
Origin of life Evidence for evolution Natural Selection Hardy-Weinberg Allelic Frequencies Speciation Isolation Allopatry Sympatry Adaptive radiation Patterns, rate			
Ecology	50-55	#12	Sept.
Biosphere Ecosystems Trophic levels Population dynamics Competition Predation Symbiosis Biomes Biogeochemical cycles			
Chemistry	1-4	#2 *	Oct.
Water and bonding Water as solvent pH Role of Carbon			
Organic molecules	5		Oct.
Carbohydrates Lipids Proteins Nucleotides			

Cells	6, 7, 11	#1	Mid Oct.
Metabolism Enzymes Enzymatic pathways ATP Cell Communication			

Mitosis/Meiosis	12, 13	#3	Oct./Nov.
Eukaryotes Cell division Cell cycle Life cycles Phases Asex. vs. Sex.			
Photosynthesis	10	#4 *	Thanksgiving
Nature of light Chlorophyll Light and light indep. Rxns. C3 and C4 plants			
Respiration	8, 9	#5 *	Christmas
Principles of water movement Osmosis Cell membrane Transport Oxidation/Reduction Chemiosmosis Kreb's cycle Electron transport chain Oxidative phosphorylation Catabolic pathways			
DNA	16-21	#6 At Canisius	January
DNA-Protein Transposable elements RNA Gene technology			
Genetics	14, 15	#7 and #8	By end of 2nd semester, for midterm
Probability Mendel Alleles Sex linkage Abnormalities Genes			

Taxonomy of Kingdoms, Plants	27-34	# 9 *	Feb. and March
Monera Protist Fungi Coelomates Protostomes Deuterostomes Vertebrates Plant morphology Plant reproduction Plant hormones			
Animal form/fxn.	40-49	#10	April
Digestive system Circulatory system Respiratory system Regulation Excretory system Immunology Endocrine system Nervous system Reproductive system			
Review			May

*denotes a lab done with Vernier probes and computers, also, many other labs are done in addition to the required 12, that support the material that we are studying at that time.

Lab Component

The course I teach focuses around the idea that science and specifically, biology is all about science as inquiry, and as a process, focusing on the idea that every day we encounter questions and problems. Many times throughout the year there are situations that involve proposing a hypothesis, collecting some data and presenting your findings to the scientific community (class) and discussing the results as valid or scrutinizing the results and critically looking at the data to ascertain patterns or conclusions.

All of the labs in the above table represent "wet-labs" we do from the *College Board AP Lab Manual for Students* (Diffusion and Osmosis, Enzyme Catalysis, Mitosis and Meiosis, Plant Pigments and Photosynthesis, Cell Respiration, Molecular Biology, Genetics of Organisms, Population Genetics and Evolution, Transpiration, Physiology of the Circulatory System, Animal Behavior, and Dissolved Oxygen and Aquatic Primary Productivity). Labs make up at least 25% of instructional time, as

labs are done in lab as well as in class. For each of the labs, students complete pre-lab questions to focus their attention, conduct the labs in lab working in pairs, then write up a formal lab report including questions, hypotheses, results and discussion. The lab is then discussed in class to check for validity and possible sources of error. Other labs that we do in addition to those mentioned above, include, but are not limited to: Protein Synthesis, Evidence of Evolution, Investigating Enzyme Reaction Rates Using Toothpickase, Osmosis, Isolating DNA, Corn Lab, Can You Catch a Fish on a Moonbeam?, The Need for Speed: An Enzyme-Substrate Model, Introduction to Plant Structure Lab, Sea Urchin Lab, Virtual Frog Dissection Kit, Peppered Moth Simulation, Investigating Cell Division: Onion Root Tip Mitosis, Stomata Activity- Is This Swiss Cheese?. These are all "wet-labs" with the exception of the Sea Urchin Lab, Virtual Frog Dissection, and Peppered Moth Simulation, which allow kids to manipulate data electronically to see the outcome of various situations.

Teaching Strategies

Students learn in many different ways in this class. In addition to doing the many labs we do, students outline chapters from the textbook, sit through lectures, and do power point presentations. They also do research projects each marking period, focusing on a topic that is relevant to their lives and do a report to the rest of the class. To focus my teaching (and not bore students), the class is focused around the eight themes contained in the AP Biology curriculum requirements. I also stress throughout the year the underlying nature of evolution that permeates each of the topics that we study. I point out how it plays a role and students draw conclusions and make connections between and among other species through evolutionary connections. I also continually focus their thinking towards taking what is learned in class and applying it to real world situations by reading articles to them and also, having them read articles and speak critically about them and how it applies to their lives. For example, with the decline of bee species around the country possibly being due to the increase in cell phones there was a discussion of how they know those facts, how they test for it, what may be causing it and the possible outcomes if the problem persists indefinitely.

Student Evaluation

There are a number of different means of assessment including: Unit Tests (which include both essay and multiple choice questions), Quizzes (40%), Labs and Formal Lab Reports (30%), Outlines, Diagrams, Pre Labs, Article Critiques, Research Projects among other things that come up throughout the year (30%).