AP Biology Syllabus

Course Overview:

The AP Biology course is designed to offer students a solid foundation in first-year college-level biology. The course is designed around the AP Biology Curriculum Framework Big Ideas and Enduring Understanding that focuses on the major concepts in biology and their connections **[CR2]**. Additionally, the Curriculum Framework provides a basis for students to develop a deep conceptual understanding as well as opportunities to integrate biological knowledge and the science practices through inquiry-based activities and laboratory investigations.

Throughout the course, students are given opportunities to use their scientific knowledge to make predictions and compare those predictions with existing data. At the end of the course, students will ideally be able to connect new concepts with previous knowledge and continue to expand their biological understanding.

Regardless of career choice, students will be able to apply their science literacy to their everyday lives; which might include critical analysis of current studies, voting decisions, and/or overall contributions to society.

Course Organization:

Students will be given a copy of the big ideas and enduring understandings to self-monitor mastery of these major organizing tools. The big ideas are interrelated, and they will not be taught in isolation. The course will connect the enduring understandings from one big idea with those of the others wherever practical. The learning objectives will be used to build the course organization while applying specific scientific process skills.

This course is structured around the four big ideas and the enduring understandings identified in the Curriculum Framework. **[CR2]** All essential knowledge will be taught and all learning objectives will be addressed through this curriculum. The course will focus on inquiry-based laboratory work and the use of the seven science practices in both lab and non-lab activities.

Big Idea 1: Evolution

- Mathematic Modeling: Hardy-Weinberg:
    - Students use Excel spreadsheet development to investigate factors affecting Hardy-Weinberg Equilibrium.
- Understand Evolutionary Relationships with BLAST:
    - Students use NCBI to compare DNA and protein sequences for organisms to test student-generated hypotheses on their relatedness.

Big Idea 2: Cellular Processes: Energy and Communication

- Diffusion and Osmosis:
    - Students investigate diffusion and osmosis in model systems and in plant tissues that they manipulate.
- Photosynthesis:
    - Students investigate photosynthetic rate under a variety of student selected conditions.

Big Idea 3: Genetics and Information Transfer

- Cell Division: Mitosis and Meiosis:
    - Students compare mitotic rate after exposure to lectin or other substances presumed to affect mitotic rate.
- Biotechnology: Bacterial Transformation:
    - Students investigate bacterial transformation by altering student-selected procedural components to affect transformation efficiency.

Big Idea 4: Interactions

- Transpiration:
    - Students investigate the movement of water through plants in a model system by altering biotic or abiotic factors of the system.
- Enzyme Activity:
    - In an open inquiry lab, students will investigate and quantify factors that affect enzyme action.

Science Journal [CR8]

A critical part of the AP Biology course is maintenance of a laboratory notebook. There are two components to the laboratory notebook:

1. Investigative lab-students record their observations of the standard protocols of the eight inquiry labs as well as develop potential questions to explore. This is also where they specify their research question, formulate hypotheses, and design a controlled experiment. Data collection and analysis also occurs here. **[CR8]**
2. Science practice-students are given a variety of scenarios or case studies where they are asked to apply one or more of the seven science practices outlined in the AP Biology Curriculum Framework. The scenarios or case studies may ask students to analyze date, interpret graphical information, determine appropriate graphing techniques to best present data, and/or predict outcomes of scientific experiments. Overall these activities will provide opportunities to apply scientific reasoning to a variety of scenarios that may or may not apply to the current content under discussion.

Laboratory

The students will be engaged in investigative laboratory work for a minimum of 25% of instructional time **[CR7]**. These labs will be inquiry based student-directed investigations. As a culmination of their investigations, students will write formal reports, prepare a presentation for peer review of their experimental design and results, or create a poster outlining their scientific methods **[CR8]**. There will be at least two laboratory experiences per big idea (listed above) from the *AP Biology Investigative Lab Manual: An inquiry-based approach (2012). The descriptions summarize the student inquiry portion of the investigation. Additional prescribed activities supplement the student inquiry.*