Science Standard
Catalina Foothills School District
High School: Biology

Biology is a laboratory-based course that incorporates aspects of inquiry, cooperative learning and independent research. The course is designed for students who have self-study habits and comprehend scientific concepts with little difficulty. A diverse range of topics will be covered including cellular biology, genetics, evolution and ecology. Students will be engaged in activities that promote analytical thinking, scientific inquiry, and development of higher level cognitive skills while working to improve their organization and communication skills (oral and written). The course will make use of sophisticated laboratory equipment, technological resources, and media equipment to enhance the inquiry process.

SCIENTIFIC INQUIRY

SCIENTIFIC INQUIRY: GENERATING SCIENTIFIC QUESTIONS

BIO.1a.1 Frames testable questions showing evidence of observations and connections to prior knowledge.

BIO.1a.2 Develops a testable question appropriate to the scientific domain being investigated.

SCIENTIFIC INQUIRY: FORMULATING HYPOTHESES

BIO.1b.1 Develops a testable hypothesis based upon evidence of scientific principles, probability and/or modeling.

BIO.1b.2 Clearly distinguishes relationships between the dependent and independent variables (required: cause and effect or correlation) within a testable hypothesis).

SCIENTIFIC INQUIRY: DESIGNING INVESTIGATIONS

BIO.1c.1 Specifies the parameters of measurement.

BIO.1c.2 Describes suitable controls for the investigation.

BIO.1c.3 Designs procedures that appropriately address the hypothesis.

SCIENTIFIC INQUIRY: DATA COLLECTION

BIO.1d.1 Creates and demonstrates safe and ethical procedures.

BIO.1d.2 Uses units of measurement with appropriate degree of accuracy.

BIO.1d.3 Creates procedures that appropriately and adequately address the hypothesis (for example: adequate sample size, multiple trials).

BIO.1d.4 Creates a suitable method of recording data.

SCIENTIFIC INQUIRY: ANALYSIS

BIO.1e.1 Interprets data to describe relationships between variables (for example: positive, negative, no relationship).

BIO.1e.2 Incorporates mathematical analysis, where appropriate.

BIO.1e.3 Critiques the investigation for possible sources of error and suggests corrections.

CONCLUSIONS AND EXTENSIONS

BIO.1f.1 Makes evidence-based predictions (for example: extrapolations and interpolations).

BIO.1f.2 Evaluates whether the data support the hypothesis.

COMMUNICATION

BIO.1g.1 Uses suitable media to inform an audience about an investigation.

BIO.1g.2 Applies appropriate ethics (for example: language, style, citations).

INTERACTION OF SCIENCE AND SOCIETY

BIO.2.1 Describes the interaction of science, human curiosity and societal needs (for example: investigating the cell cycle to find out why cancer occurs and how to develop cures for it).

BIO.2.2 Critically analyzes the science concepts behind societal issues (for example: analyzing the ecological effects of land use).

SYSTEMS THINKING (CFSD Deep Learning Proficiency – DLP)

SYSTEMS THINKING: CHANGE OVER TIME

BIO.3a.1 Explains how a system's components change over time (for example: evolution of a species).

SYSTEMS THINKING: INTERDEPENDENCIES

BIO.3b.1 Explains the causal relationships in a system as being either positive or negative feedback relationships (for example: population fluctuation in predator and prey systems; protein feedback on gene transcription).

SYSTEMS THINKING: SYSTEM-AS-CAUSE

BIO.3c.1 Explains reasons why specific behaviors result from the organization of a system (for example: how plants balance photosynthesis with water loss).

STRUCTURE AND FUNCTION OF CELLS

BIO.4.1 Describes the interaction of cell organelles in prokaryotes and eukaryotes.

BIO.4.2 Analyzes the relationship between surface area-to-volume ratio and cell size.

BIO.4.3 Compares and contrasts methods of cellular transport (required: diffusion, osmosis, active transport, passive transport).

BIO.4.4 Describes the response of a cell in various environments.

MOLECULES, MACROMOLECUES, AND CELLS

BIO.5.1 Compares the structure, properties, function, and size of proteins, lipids, nucleic acids, carbohydrates, water, atoms, molecules, and macromolecules.

BIO.5.2 Describes the spatial relationship and interaction of an organism's components, from atom to organism.

METABOLISM IN CELLS

BIO.6.1 Explains the system of ATP production (required: cellular respiration as a system).

BIO.6.2 Explains the purpose of photosynthesis (see Ecology).

BIO.6.3 Examines the purpose and process of protein synthesis (required: as a system).

CELL CYCLES

BIO.7.1 Explains the system of DNA replication.

BIO.7.2 Explains the cell cycle and how it maintains genetic continuity.

BIO.7.3 Explains meiosis and fertilization and how they lead to genetic variation.

GENETICS

BIO.8.1 Outlines the relationships among nucleic acids, genes, chromosomes and karyotype in viruses, prokaryotes, and eukaryotes.

BIO.8.2 Applies the laws of Mendelian genetics (required: calculate the probability of phenotype and genotype from a monohybrid cross using a Punnett square).

BIO.8.3 Explains the causes of genetic variation, cancer, and genetic disorders.

EVOLUTION I

BIO.9.1 Provides evidence to support biogenesis.

BIO.9.2 Explains the effects of major events in the evolution of Earth and life.

BIO.9.3 Provides evidence to support evolutionary theory.

EVOLUTION II

BIO.10.1 Analyzes the degree of relatedness among various species using cladistics, phylogeny, morphology, and DNA analysis.

BIO.10.2 Explains the relationship of reproduction, recombination, mutation, adaptation, and environmental change with natural selection, speciation and biodiversity.

ECOLOGY

BIO.11.1 Analyzes the relationships and dynamics among levels of organization (required: organism to biosphere) within the biosphere.

BIO.11.2 Relates biogeochemical cycles and energy flow (required: nitrogen, carbon, phosphorous, water, rock, food webs, process of photosynthesis).

BIO.11.3 Explains the system of photosynthesis.