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Teacher Contact

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* **Was this course Previously Approved by UC?** No

* **Course Title:** a-g Biology

* **Transcript Title /Abbreviation:** Transcript Title /Abbreviation: Course Code
a-g Biology

* **Seeking "Honors" Distinction:** No

* **Subject Area:** Laboratory Science

* **Category:**

* **Grade Level
for which this
course has been
designed:**

9 10 11 12

* **Unit Value:** 1.0 (one year, 2 semesters, or 3 trimesters equiv.)

* **Is this course classified as a Career Technical Education:** No

* **Brief Course Description**

Students will use experimentation and inquiry to explore the basic concepts of biological science. All aspects of life will be investigated, including cellular structure, structure and function of plants and animals, genetics, evolution, diversity and principles of classification, and ecological relationships.

Pre-Requisites

Grade C or better in Algebra 1 - Required - Required

Co-Requisites

Laboratory component is 20% of course - Required - Required

**Context for Course
(optional)**

**History of Course Development
(optional)**

Textbooks

TEXTBOOK 1

*** Title:** Biology, The Dynamics of Life

*** Edition:** 2005 California Edition

Publication
Date:** 2005

Publisher:** Glencoe

Author(s):** Biggs, et. al

**URL
Resource:**

*** Usage:** Primary Text

Read in entirety or near entirety

Supplemental Instructional Materials*** Course Purpose**

Students will demonstrate understanding of important concepts applicable to all living organisms and systems. Laboratory inquiry, demonstrations and course work are designed to develop a thorough understanding of cellular biology, genetics, ecological relationships, chemistry of life, as well as an understanding of natural history in regards to both the animal and plant kingdoms (taxonomy).

*** Course Outline**

The following topics are covered in depth through the text, lecture, and lab work. Each topic is reviewed in class, with student assignments including reading, responding in writing to section, chapter and unit review, demonstrating knowledge through class presentation, and completing lab assignments and lab manuals.

Topics include:

- *Building student understanding that fundamental life processes of plants and animals depend on a variety of chemical reactions that are carried out in specialized areas of the organism's cells.
- *Mutation and sexual reproduction lead to genetic variation in a population.
- *Multi-cellular organism development from a single zygote, and its phenotype depends on its genotype, which is established at fertilization.
- *Genes are a set of instructions, encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism.
- *Genetic composition of cells can be altered by incorporation of exogenous DNA into the cells.
- *Stability in an ecosystem is a balance between competing effects.
- *Frequency of an allele in a gene pool of a population depends on many factors, and may be stable or unstable over time.
- *Evolution is the result of genetic changes that occur in constantly changing environments.
- *Coordinated structures and functions of organ systems result in the internal environment of the human body remaining relatively stable (homeostatic), despite changes in the outside environment.
- *Organisms have a variety of mechanisms to combat disease.

Unit 1 - What is Biology

- *Biology: The Study of Life

Unit 2 - Ecology

- *Principles of Ecology
- *Communities and Biomes
- *Population Biology
- *Biological Diversity and Conservation

Unit 3 - The Life of a Cell

- *The Chemistry of Life
- *A View of the Cell

- *Cellular Transport and the Cell Cycle
- *Energy in a Cell
- Unit 4 - Genetics
 - *Mendel and Meiosis
 - *DNA and Genes
 - *Patterns of Heredity and Human Genetics
 - *Genetic Technology
- Unit 5 - Change Through Time
 - *the History of Life
 - The Theory of Evolution
 - *Primate Evolution
 - *Organizing Life's Diversity
- Unit 6 - Viruses, Bacteria, Protists, Fungi
 - *Viruses and Bacteria
 - *Protists
 - *Fungi
- Unit 7 - Plants
 - *What is a plant?
 - *The Diversity of Plants
 - *Plant Structure and Function
 - *Reproduction
- Unit 8 - Invertebrates
 - *What is an animal?
 - *Sponges, Cnidarians, Flatworms, and Roundworms
 - *Mollusks and Segmented Worms
 - *Arthropods
 - *Echinoderms and Invertebrate Chordates
- Unit 9 - Vertebrates
 - *Fishes and Amphibians
 - *Reptiles and Birds
 - *Mammals
 - *Animal Behavior
- Unit 10 - The Human Body
 - *Protection, Support and Locomotion
 - *The Digestive and Endocrine Systems
 - *The Nervous System
 - *Respiration, Circulation, and Excretion
 - *Reproduction and Development

*Immunity from Disease

* **Laboratory Activities**

School: CORE Butte Charter School

Module 1: Biology, The Study of Life

Problem

What life characteristics can be observed in a pill bug?

Objectives

In this lab, students will:

Observe whether life characteristics are present in a pill bug.

Measure the length of a pill bug.

Experiment to determine if a pill bug responds to changes in its environment.

Module 2: Accuracy and Precision

Problem

What is the importance of taking accurate measurements?

Objective

In this lab, students will:

Hypothesize why accuracy is needed within the field of science.

Measure the length, height, volume, mass of various items.

Compare results of measurements with others.

Evaluate the accuracy of their measurement.

Module 3: Biological Diversity and Conservation

Problem

Why is it hazardous to keep an exotic animal as a pet?

Objectives

In this lab, students will:

Select one animal that is considered an exotic pet.

Use the Internet to collect and compare information from other students.
Students will collect data on rising populations of exotic pets released into the wild and disaggregate data and search for trends.

Module 4: Energy of the Cell

Problem

How do different wavelengths of light a plant receives affect its rate of photosynthesis?

Objectives

In this lab, students will:

Observe photosynthesis in an aquatic plant.

Measure the rate of photosynthesis during both light and dark phases. Research the wavelengths of various colors of light.

Observe how various wavelengths of light influence the rate of photosynthesis.

Use the Internet to collect and compare data from other students.

Module 5: Riparian Forest Ecosystem

Problem

What is the importance of river ecosystems?

Objectives

In this field lab, students will:

Examine the members of the Sacramento Riparian Forest Ecosystem.

Collect data from and identify various plant species.

Module 6: Mendel's Genetics

Problem

Can the phenotypes and genotypes of the parent plants that produced two groups of seeds be determined from the phenotypes of the plants grown from the seeds?

Objectives

In this lab, students will:

Analyze the results of growing two groups of seeds.

Draw conclusions about phenotypes and genotypes based on those results.

Module 5: Theory of Evolution

Problem

How and where did life begin?

Objectives

In this lab, students will:

Collect data on the various accepted supports for evolution. Collect data on support for intelligent design. Students will examine various fossils and classic examples, which add support to the theory. Students will examine the embryo of human, chicken, lizard, and salmon to compare/contrast at such an early developmental stage.

Module 6: Fungi Kingdom

Problem

How can you determine the affect of temperature on the metabolism of yeast?

Hypothesis

Decide on one hypothesis that you will test. Your hypothesis might be that low temperature slows down the metabolic activity of yeast, or that a high temperature speeds up the metabolic activity of yeast.

Objectives

In this lab, students will:

Measure the rate of yeast metabolism using a BTB color change as a rate indicator.

Compare the rates of yeast metabolism at several temperatures. Draw conclusions based on class-wide data collected.

Module 7: Plant Anatomy Purpose and Function

Problem

Does the number of petals effect reproduction within flowering plants?

Objectives

In this lab, students will:

Collect a flowering plant sample, count the number of petals and dissect the specimen to calculate the number of ovaries. Students will calculate the ratio of petals to ovaries to determine the relationship. Students will also compare other attributes that may affect plant reproduction success.

Module 8: Invertebrates

Problem

What are the key physical characteristics of invertebrates?

Objectives

In this lab, students will:

Examine the key classes found within the invertebrates. Students will classify organism samples based on observable characteristics. Students will create dichotomous keys to explain their organization method.

Module 9: Vertebrates

Problem

What benefit does a vertebral column offer to the phylum Chordate?

Objectives

In this lab, students will:

Observe the characteristics of dogs of various sizes. Students will calculate the length of vertebral columns in three different breeds and compare mobility differences. Record the adaptations of different dog breeds. Compare and contrast the characteristics of breeds of dogs. Students will hypothesize the function of short versus long vertebral column.

Module 10: Human Immune System

Problem

What characteristics allow a parasite, bacteria or virus to thrive within the human population?

Objectives

In this lab, you will:

Choose a parasite, bacteria or virus to create which will eliminate the population. Students must choose symptoms, resistances, and level of vaccine. Students must successfully infect all areas of the globe with minimal detection. Students must create a disease with minimal incubation time.

Module 11: Interdependence

Problem

How are species interdependent upon one another?

Objectives

In this lab, students will:

Simulate a deer and wolf population. Students will observe fewer wolves are necessary to balance out the deer population. Students will analyze trends in both populations when food was plentiful and minimal. Students will brainstorm about why food amounts may fluctuate from year to year. Students will debate the effects hunting laws have on population species. Students will look closely at the Chinook salmon population trends in the past ten years.

Module 12: Feather River System

Problem

Why has the Chinook salmon population declined and what is the Fish and Game Agency doing to combat the decline?

Objectives

In this field lab, students will:

Observe the lifecycle of the Chinook salmon and Steelhead Trout. Students will visit the Feather River Fish Hatchery and observe the process the fishes go through once they reach that point in the river. Students will observe the purpose

and function of the hatchery along with its importance to the local river system.

Module 13: Human Heart and Circulatory System

Problem

How does the human heart function?

Objectives

In this lab, students will

Observe a beef heart. Students will examine and dissect a pig heart identifying each part and its function within the circulatory system. Students will compare the sizes of various species hearts and hypothesize the necessary size difference. Students will also observe a damaged heart due to obesity and the effects of a larger heart within humans.

Module 14: Diseases

Problem

What are the major diseases that plague the current human population?

Objectives

In this lab, students will:

Research major diseases and their effects- hemorrhagic fever viruses, tularemia, bubonic plaques, anthrax, and others. Students will explore the CDC website and research data of each disease. Students will share results of numbers infected, killed, outbreaks, etc.

Module 15: Earthworm Dissection

Problem

How does the internal organization of Annelids differ from other species?

Objectives

In this lab, students will:

Dissect an earthworm. Students will observe various organs and note their functions. Students will compare Annelids to other invertebrates.

Module 16: Insects

Problem

What are the key characteristics that separate insects from other species?

Objectives

In this lab, students will:

Observe living insect specimens and note similar characteristics amongst them- grasshoppers, pill bugs, moths, beetles (at various life stages). Students will compile a list of similar characteristics as a group.

Module 17: Mitosis

Problem

What are the steps of mitosis?

Objectives

In this lab, students will:

Create a visual representation of mitosis. Student will identify several onion root tip cells undergoing each stage of mitosis. Students will calculate which stage of a cell life cycle is occupied by mitosis versus the growth stages.

Module 18: Meiosis

Problem

What is the meiosis process and how does it differ from mitosis?

Objectives

In this lab, students will:

Create a visual of meiosis. Students will use manipulatives to illustrate the process of meiosis. Students will use edible manipulatives to describe genetic recombination.

Module 19: Metabolism

Problem

How does the cell process food?

Objectives

In this lab, students will:

Review cell respiration. Students will observe a two-minute movie on cell respiration. Students will create a poster illustrative and identifying the various organelles and processes of cell respiration. Students will share their projects and describe the process aloud.

Module 20: Homeostasis

Problem

How does the body regulate itself?

Objectives

In this lab, students will:

Conduct a number of exercises intended to increase their heart rate. Students will observe the consequences of increasing their heart rate. Students will calculate the change in breathing rate, body temperature, physical changes, and vision once their heart rate increased. Students will also observe the gas produced when exhaling by blowing into lime-water, which turns cloudy with the presence of carbon dioxide.

Module 21: Body Tissues

Problem

Are there different tissues within the body? What are their functions and locations?

Objectives

In this lab, students will:

Identify the four main body tissues. Students will obtain samples from pigskin, pig muscle, pig ligament. Students will also observe prepared slides of each type. Students will create working samples of biceps and triceps muscles using simple materials.

Module 22: Biological Environmental Issues

Problem

What environmental issues are being caused by humans?

Objectives

In this lab, students will:

Research a current issue in the news caused by human impact on the environment. Students will create a PSA informative 3 minute commercial on their topic. Students will use Garage Band, Apple software to create their commercial. Students will create audio and visual elements to their commercial.

Module 23: Macromolecules of Life

Problem

What are the major chemical molecules that all living things share?

Objectives

In this lab, students will:

Review the macromolecules of life. Students will create simple 3D examples of lipids, carbohydrates, proteins, and nucleic acids. Students will also pull random samples from a paper bag and determine which of the four macromolecules the sample falls into.

Module 24: Decoding DNA

Problem

Can a simple DNA chain be decoded and result in a species?

Objectives

In this lab, students will:

Be given a simple DNA strand. Students will create the tRNA and mRNA that coincides with their sample. Students will then decode the RNA to determine the corresponding amino acids. Students will then determine the appropriate physical characteristic described with the amino acid sequence. Student will draw their fictitious creature which matches their given DNA.

Module 25: World Biomes

Problem

What are biomes and how dramatic can they vary?

Objectives

In this lab, students will:

Review the world's biomes. Students will calculate temperate averages using current ranges. Students will determine key characteristics of each biome-

precipitation and temperature range. Students will determine the local biome and research known information concerning the Sacramento River Valley.

Module 26: Local micro-biomes

Problem

Can several different micro-biomes be found locally?

Objectives

In this lab, students will:

Visit the riparian forest along the Sacramento River. Students will visit the foothill region of Butte County. Students will visit the chaparral of the Forest Ranch area. Students will visit the coniferous forest of HWY 32. Students will compare and contrast the temperature ranges of the various regions and the local plant/animal life found.

Module 27: Protozoa

Problem

Where can protozoans and simple organisms be found?

Objectives

In this lab, students will:

Collect water samples from various locations within the city of Chico. Students will examine each water sample using a compound microscope. Students will identify each different type of organism found within each water sample. Students will determine which water sample collected had the greatest amount of diversity. Students will hypothesize why great diversity was present in some samples and lacking in others.

Module 28: The Earth's Water Resource

Problem

How is water treated as a resource within the local community?

Objectives

In this lab, student will:

Visit Chico Water Treatment Plant. Students will observe how gray water is brought and treated at the plant for redistribution to local agricultural lands.

Module 29: CSU, Chico Farm

Problem

What role does genetics research play on local farms?

Objectives

In this lab, students will:

Visit CSU, Chico Farm Sheep and Goat Unit. Students will learn how goats and sheep are artificially inseminated to produce certain desired offspring. Students will examine female egg and male sperm using compound microscopes for fluidity and other specifics. Students will observe the insemination process of a sheep.

Module 30: Speciation

Problem

How do new species arise?

Objectives

In this lab, students will:

Review reasons for speciation. Students will review the case of the peppered moth. Students will hypothesize what might have happened to the species should no environmental changes occurred. Students will determine the driving force behind speciation. Students will look at four different species that branched off of their original species due to various reasons. Students will determine when a species is considered "new" and "different" from its parent or original species.

* Key Assignments

The course is designed to cover the following topics through careful text reading,

analysis and synthesis of progressive learning. Text assignments will include response to section, chapter, and unit review questions, as well as quizzes, informal checks for understanding, and embedded assessments. Research and demonstration of understanding will include web-based research and presentation, research of current biology studies published reports, and current events examination and reporting.

Topics for text assignments, web research and current studies will include but not be limited to:

Chemistry of Life

Cellular Biology

Heredity and Evolution

Heredity

Molecular Genetics

Evolutionary Biology

Organisms and Populations

Diversity of Organisms (taxonomy)

Structure and Function of Plants and Animals

Interdependence

Introductory anatomy

Introductory physiology

Biology Group Research Assignment

Theme: World Biomes

Students will be placed into groups of three. One student will draw a biome for their group to present. Students will use various resources (i.e. internet, library, newspaper, etc.) to research their biome.

Student 1: Responsible for describing the biome's primary characteristic. Student will also define the key locations the biome may be found on the globe.

Student 2: Responsible for describing the type of vegetation that flourishes in the specific biome. Student will also describe what key characteristics allow for specific vegetation to survive.

Student 3: Responsible for describing the various types of animals, insects, protists, and bacterium that thrive in the assigned biome. Student will also report on the effects of the human population crowding natural habitats.

As a group: Students will create a poster describing each criterion for the assigned biome. Students will include a title, images of various species, data describing the annual precipitation and temperatures, and a map highlighting where the biome can be found. Students will present their poster and research orally to the class.

Biology independent research assignment: Nanotechnologies & Biology

Students are to research nanotechnologies and their current and proposed role within the biological and medical fields. Students are to give specific examples how the new technology will be implemented, costs, infrastructure needed to support the use of, etc. Students will also report on the predicted downfalls or cons to using nanotechnologies. Students will create a rough and final draft which will be reviewed by their English course instructor for grammar and sentence structure. Students will also create a works cited page. The research paper will be typed with APA formatting.

* Instructional Methods and/or Strategies

College Model of Education: Personalized Learning Model emphasizes independent study while attending Resource Center classes two to three times weekly (once weekly for science labs).

Classroom Instruction

Direct Instruction
Project group work
Independent Study
Interactive online instruction
Lab assignments/experiments
Work individually with Personalized Learning Teacher/Highly Qualified Teacher
If not enrolled in a class - meet with Highly Qualified Teacher weekly for one hour/week.

Student will use the text as a primary resource. Lecture, laboratory experiments, group projects, individual and group research, oral and written presentation will be used to reinforce learning. Students will summarize each unit and answer questions about each unit, and respond to critical thinking challenges. Students will write well-developed essays that indicate mastery of topics/concepts and to demonstrate college preparatory writing ability. Student will meet weekly with Personalized Learning Teacher/Highly Qualified Teacher to discuss material covered in the course, review work and to take tests, which include comprehensive midterm/final.

* Assessment Methods and/or Tools

- Attendance at Resource Center Lab Class weekly
- Written assignments evaluated by provided writing rubrics
- Oral presentations
- Discussions: classroom participation and small group work.
- Weekly homework assignments
- Chapter/Unit tests
- Comprehensive midterm/final

Assessment tools may also include the following:

- Participation in weekly lab activity with graded lab manual (science courses)
- Student demonstrations
- Student work samples
- Research Projects (individual/group)
- Projects: Power Point Presentation, brochures, community service, etc.

* Lab Notebook

Exams, homework assignments, discussions, oral presentations, and writing

assignments are used to assess student progress. Exams for each unit consist of short essay format or extensive essay. Essays emphasize critical thinking skills and demonstrate analysis and synthesis of ideas. All work is corrected by the course instructor and/or Personalized Learning Teacher/Highly Qualified Teacher. Feedback is provided on all written work with student revision and rewrite completed when appropriate.

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