

Area of Focus: Biology, Unit 1: Describe the structure and function of organs.

Teaching Methods and Process:

Research:

- Diagram and label the structure of the primary components of representative organs in plants and animals (e.g., heart - muscle tissue, valves and chambers; lung - trachea, bronchial, alveoli; leaf - veins, stomata; stem - xylem, phloem, cambium; root - tip, elongation, hairs; skin - layers, sweat glands, oil glands, hair follicles).
- Describe the function of various organs (e.g. heart, lungs, skin, leaf, stem, root, ovary).
- Research and report on technological developments related to organs.

Reason

- Compare the structure and function of organs in one organism to the structure and function of organs in another organism

Relate

- Relate the structure of organs to the function of organs.
- Students will apply acquired scientific knowledge to their surroundings and interactions with the living planet.

Record

- Frequent journal entries summarizing learning experiences.
- Daily note taking.

Learning Evaluation:

- Summative assessments including multiple response, open answer and written response tests and quizzes.
- Original content journal entries, presentations, and writing.
- One on One oral comprehension assessment with instructor.

Biology, Unit 2: Describe the relationship between structure and function of organ systems in plants and animals.

Teaching Methods and Process:

Research:

- Describe the structure and function of various organ systems (i.e., digestion, respiration, circulation, protection and support, nervous) and how these systems contribute to homeostasis of the organism.

Reason

- Examine the relationships of organ systems within an organism (e.g., respiration to circulation, leaves to roots) and describe the relationship of structure to function in the relationship.
- Compare the structure and function of organs in one organism to the structure and function of organs in another organism

Relate

- Relate the tissues that make up organs to the structure and function of the organ.

Record

- Frequent journal entries summarizing learning experiences.
- Daily note taking.

Learning Evaluation:

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- One on One oral comprehension assessment with instructor.

Biology, Unit 3: Describe the fundamental chemistry of living cells and describe the flow of energy and matter in cellular function.**Teaching Methods and Process:****Research:**

- List the major chemical elements in cells (i.e., carbon, hydrogen, nitrogen, oxygen, phosphorous, sulfur, trace elements).
- Identify the function of the four major macromolecules (i.e., carbohydrates, proteins, lipids, nucleic acids).
- Measure the production of one or more of the products of either photosynthesis or respiration.

Reason

- Explain how the properties of water (e.g., cohesion, adhesion, heat capacity, solvent properties) contribute to maintenance of cells and living organisms.
- Explain the role of enzymes in cell chemistry.

Relate

- Distinguish between autotrophic and heterotrophic cells

Record

- Frequent journal entries summarizing learning experiences.
- Illustrate the cycling of matter and the flow of energy through photosynthesis (e.g., by using light energy to combine CO₂ and H₂O to produce oxygen and sugars) and respiration (e.g., by releasing energy from sugar and O₂ to produce CO₂ and H₂O).
- Daily note taking.

Learning Evaluation:

- Summative assessments including multiple response, open answer and written response tests and quizzes.
- Original content journal entries, presentations, and writing.
- One on One oral comprehension assessment with instructor.

Biology, Unit 4: Investigate the structure and function of cells and cell parts.**Teaching Methods and Process:****Research:**

- Identify structural features of all cells.
- Explain how cells divide from existing cells.
- Experiment with microorganisms and/or plants to investigate growth and reproduction

Reason

- Describe cell theory and relate the nature of science to the development of cell theory (e.g., built upon previous knowledge, use of increasingly more sophisticated technology).
- Describe how the transport of materials in and out of cells enables cells to maintain homeostasis (i.e., osmosis, diffusion, active transport).

Relate

- Relate the relationship between the organelles in a cell and the functions of that cell.

Record

- Journal entries summarizing learning experiences.
- Daily note taking.

Learning Evaluation:

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- Original content journal entries, presentations, and writing.

- One on One oral comprehension assessment with instructor.
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Biology, Unit 5: Compare sexual and asexual reproduction. Predict and interpret patterns of inheritance in sexually reproducing organisms.

Teaching Methods and Process:

Research:

- Language science students should use: DNA, replication, fertilization, dominant trait, recessive trait, genetic engineering, gene splicing, phenotype, genotype, sexual reproduction, asexual reproduction, chromosome, gene, mutation, cloning, inheritance, bioethics, pedigree
- Explain the significance of meiosis and fertilization in genetic variation.
- Explain Mendel's laws of segregation and independent assortment and their role in genetic inheritance.
- Demonstrate possible results of recombination in sexually reproducing organisms using one or two pairs of contrasting traits in the following crosses: dominance/recessive, incomplete dominance, codominance, and sex-linked traits.

Reason

- Formulate, defend, and support a perspective of a bioethical issue related to intentional or unintentional chromosomal mutations.
- Analyze bioethical issues and consider the role of science in determining public policy.

Relate

- Relate Mendelian principles to modern-day practice of plant and animal breeding.
- Compare the advantages/disadvantages of sexual and asexual reproduction to survival of species.

Record

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Learning Evaluation:

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Biology, Unit 6: Explain how the structure and replication of DNA are essential to heredity and protein synthesis.

Teaching Methods and Process:

Research:

- Use a model to describe the structure of DNA.
- Explain the importance of DNA replication in cell reproduction.
- Describe how mutations may affect genetic expression and cite examples of mutagens.
- Research, report, and debate genetic technologies that may improve the quality of life (e.g., genetic engineering, cloning, gene splicing).

Reason

- Summarize how genetic information encoded in DNA provides instructions for assembling protein molecules.

Relate

- Relate the historical events that lead to our present understanding of DNA to the cumulative nature of science knowledge and technology.

Record

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- Daily note taking.

Learning Evaluation:

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Biology, Unit 7: Relate principles of evolution to biological diversity. Cite evidence for changes in populations over time and use concepts of evolution to explain these changes.

Teaching Methods and Process:

Research:

- Describe the effects of environmental factors on natural selection.
- Cite evidence that supports biological evolution over time (e.g., geologic and fossil records, chemical mechanisms, DNA structural similarities, homologous and vestigial structures).

- Identify the role of mutation and recombination in evolution.
- Review a scientific article and that documents the evolution of a species.

Reason

- Identify the research methods used to gather evidence Compare selective breeding to natural selection and relate the differences to agricultural practices.
- Distinguish between observations and inferences in making interpretations related to evolution (e.g., observed similarities and differences in the beaks of Galapagos finches leads to the inference that they evolved from a common ancestor; observed similarities and differences in the structures of birds and reptiles leads to the inference that birds evolved from reptiles).

Relate

- Relate genetic variability to a species' potential for adaptation to a changing environment.
- Relate reproductive isolation to speciation.
- Relate the nature of science to the historical development of the theory of evolution.

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Biology, Unit 8: Classify organisms into a hierarchy of groups based on similarities that reflect their evolutionary relationships.

Teaching Methods and Process:

Research:

- Generalize criteria used for classification of organisms (e.g., dichotomy, structure, Language science students should use: evolution, fossil record, geologic record, molecular, homologous, vestigial structures, mutation, recombination, hierarchy, classification scheme, theory, natural selection, adaptation, evidence, inference, speciation, biodiversity, taxonomy, kingdom, virus, protist, fungi, plant, animal, dichotomy.

Reason

- Classify organisms using a classification tool such as a key or field guide.
- broad to specific).
- Explain how evolutionary relationships are related to classification systems.

Relate

- Justify the ongoing changes to classification schemes used in biology.

Record

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Biology, Unit 10: Summarize how energy flows through an ecosystem. Explain relationships between matter cycles and organisms.

Teaching Methods and Process:**Research:**

- Describe strategies used by organisms to balance the energy expended to obtain food to the energy gained from the food (e.g., migration to areas of seasonal abundance, switching type of prey based upon availability, hibernation or dormancy).
- Compare the relative energy output expended by an organism in obtaining food to the energy gained from the food (e.g., hummingbird - energy expended hovering at a flower compared to the amount of energy gained from the nectar, coyote - chasing mice to the energy gained from catching one, energy expended in migration of birds to a location with seasonal abundance compared to energy gained by staying in a cold climate with limited food).
- Use diagrams to trace the movement of matter through a cycle (i.e., carbon, oxygen, nitrogen, water) in a variety of biological communities and ecosystems.
- Explain how water is a limiting factor in various ecosystems.

Reason

- Arrange components of a food chain according to energy flow.

- Evaluate the impact of personal choices in relation to the cycling of matter within an ecosystem (e.g., impact of automobiles on the carbon cycle, impact on landfills of processed and packaged foods).
- Compare the quantity of energy in the steps of an energy pyramid.

Relate

- Research food production in various parts of the world (e.g., industrialized societies' greater use of fossil fuel in food production, human health related to food product).
- Distinguish between inference and evidence in a newspaper, magazine, journal, or Internet article that addresses an issue related to human impact on cycles of matter in an ecosystem and determine the bias in the article.

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Biology, Unit 11: Describe how interactions among organisms and their environment help shape ecosystems.

Teaching Methods and Process:

Research:

- Language science students should use: predator-prey, symbiosis, competition, ecosystem, carbon cycle, nitrogen cycle, oxygen cycle, population, diversity, energy pyramid, consumers, producers, limiting factor, competition, decomposers, food chain, biotic, abiotic, community, variable, evidence, inference, quantitative, qualitative
- Investigate an ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail.
- Research and evaluate local and global practices that affect ecosystems.

Reason

- Formulate and test a hypothesis specific to the effect of changing one variable upon another in a small ecosystem.
- Categorize relationships among living things according to predator-prey, competition, and symbiosis.

Relate

- Use data to interpret interactions among biotic and abiotic factors (e.g., pH, temperature, precipitation, populations, diversity) within an ecosystem.

Record

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Biology, Unit 12: Prepare students with assessment skills used in national standardized testing.

Data Representation:

Comprehension, Analysis and Application

Research Summary:

Comprehension, Analysis and Application

Conflicting View Points:

Comprehension, Analysis and Application