Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 1: *Use the Scientific Method, processing skills, equipment, and lab safety to solve problems.*		
A. Understand each step of the scientific method: Question or Problem, Hypothesis, Procedure, Observations, Data and Conclusion **B. Explain and emphasize that the experiment is trying to prove the established hypothesis and not proving it is still important.** **C. Students will be able to define and understand the terms control, variable, and follow an experimental model using the scientific method to answer a scientific problem.**	• Use a simple activity to demonstrate the above steps. Reiterate throughout the year during laboratory experiences. • Continue to model and introduce the creation of Data Charts and Scientific Analysis. • Model a false hypothesis and the actions taken to explain the result. • Students need to understand the difference between a scientific demonstration and a scientific experiment. • Continue to emphasize throughout the year utilizing lab experiences. • Encourage and engage in the use of Lab Reports and Lab Journals	

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Enduring Knowledge 2: *Life can be defined and is carried out in a variety of ways to accomplish the same needs.*		
A. Describe the hierarchical organization of multi-cellular organisms from the organism to systems to organs to tissues to cells. **B. Understand that cells are the basic working component of all living things.** **C. Safely and properly use a compound light microscope.** **D. Recognize parts and functions of a basic animal cell including nucleus, cytoplasm, cell membrane, mitochondria, endoplasmic reticula, Golgi bodies, ribosomes, and lysosomes.** **E. Discuss the three statements associated with cell theory.**	• Construct individual and team concept maps that address "What is Life?" Extract student preconceptions and prior knowledge to lead discussions. • Identify biotic and abiotic factors from images of various ecosystems.	

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Enduring Knowledge 3: *Systems require organization and are composed of components working together; cells are the basic working components of life.*		
A. Understand a need for an organization of living things. Discuss history of binomial nomenclature and Linneaus. **B. Introduce taxonomy and a classification system: domains, kingdoms, phyla, class, order, family, genus, and species.** **C. Describe the hierarchy of multi-cellular organisms from the organism to systems to organs to tissues to cells.** **D. Understand that cells are the basic working component of all living things.** **E. Safely and properly use a compound light microscope.** **F. Recognize parts and functions of a basic animal cell including nucleus, cytoplasm, cell membrane, mitochondria, endoplasmic reticula, Golgi bodies, ribosomes, and lysosomes.** **G. Discuss the three statements associated with cell theory.**	• Use a supermarket or similar analogy for finding desired items more efficiently and with similar characteristics. • Research the scientific name of a common pet or of local fauna or flora. • Use a mnemonic device or have students create their own to recall taxons. • Use multiple examples, including humans, to learn common taxons. • Use dichotomous keys to identify individual organisms. • Introduce the compound light microscope; parts and functions. Assess understanding of magnification and resolution. • Have students gain experience by observing small objects. • Have students make cell models and explain how cell parts work together to make cell products. • Have students research a specific human cell type; introduce formal way to cite research. • Demonstrate how to make a wet mount and use stains. • Use human cheek cells to observe basic animal cell structure.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 4: *Similarities and differences exist between living things.*		
A. Observe examples of cells from every kingdom and recognize the similarities and differences among them. **B. Connect form with function; parts exist for the jobs carried out.** **C. Connect the understanding of life processes and the diversity of life with human technology.**	• For plants: recognize cell walls, chloroplasts, vacuoles among others; characteristics such as being autotrophic via photosynthesis. Use Elodea or stain onion cells. • For fungi: recognize mycelia, hyphae, multi-nucleated, heterotrophic decomposers; importance of food web. Dissect a mushroom. • For protists: recognize a few basic types and activity; autotrophic and heterotrophic examples such as paramecium, euglena, and amoeba. • For bacteria: introduce basic microbiology in the growth and death of bacteria. Use agar dishes to grow and antibiotics to inhibit bacteria. • For viruses: introduce the debate among scientists as to what constitutes life and an introduction to how viruses • Discuss specific examples of form; multiple types of human cells; disorders that result such as sickle-cell anemia when form does not fit function. • Introduce technologies such as bioremediation, composting, bioleaching, etc. Have student teams research and present a poster of a process.	

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Enduring Knowledge 5: *Organisms inherit and acquire traits from parents.*		
A. Recognize that every organism has attributes or traits, both inherited and acquired. **B. Understand that each organism inherits a set of instructions that specifies inherited traits which are stored in chromosomes.** **C. Heredity is the passage of these instructions from one generation to another.**	• Start with individual then group concept maps, "Who are you?", and extract themes for discussion: personality and inherited traits, inheritance from parents, etc . • Compare chromosome number among various living things. • Explore various human traits: eye color, tongue rolling, dimples, etc. Compare modern human traits with prehistoric human types.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 6: *Inheritance can be understood and predicted.*		
A. Predict patterns of inheritance based on basic Mendelian genetics using Punnett Squares. **B. Understand that a pedigree can be used to understand family history and trait transmission.**	• Introduce the history of inheritance, specifically Gregor Mendel's pivotal pea plant experiments and basic laws. • Distinguish between phenotype and genotype. • Demonstrate dominance versus recessiveness of traits; the usage of Punnett squares to make predictions. Reinforce probability and percentages as mathematical ways to calculate and represent predictions. • Perform activities involving chance to understand theories (such as using Punnett Squares to predict inheritance) to actual results (using outcomes from experiments). • Study and build pedigrees tracking a trait through multiple generations of a family. • Ask students to be genetic counselors and make predictions about the inheritance of a disease or disorder.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 7: *Genes encode for proteins and can be manipulated.*		
A. Recognize that chromosomes contain genes which are made of DNA. **B. Understand that genes are recipes written in DNA that lead to the production of proteins.** **C. Understand the structure of DNA, basic transcription and structure of RNA, basic translation and structure of amino acid chains.** **D. Genetic engineering involves manipulating DNA or genes to select for desired traits.**		

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 8: *Diversity arises from mutation.*		
A. Recognize that changes in DNA, known as mutations, may change traits. **B. Understand that mutations may be good, harmless, or bad. Discussions of good; adaptation and bad; disorder or disease.** **C. Recognize mutations have led to evolution and continue to occur based on environmental agents.**	• Use comparisons of the English language; changing the order, deleting or adding letters in a sentence. Observe mutations. • Use multiple examples of specific genes leading to specific proteins which lead to specific traits; Example: Tyr gene on chromosome 11 leads to the making of the melanin protein which leads to skin pigmentation. • Discuss advantages of the sickle-cell trait, classic adaptation and origin of species. Have students individually or in groups work on presenting a genetic disorder in a brochure, poster, or media presentation.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 9: *Life arises from life; organisms carry out reproduction through conception, pregnancy, and development.*		
A. Compare asexual reproduction and sexual reproduction and the advantages and disadvantages associated with both. **B. Understand that for organisms to reproduce, cells must reproduce. Recognize cell processes associated with mitosis. Recognize that cells differentiate.** **C. Recognize that for sexual reproduction, gametes must be produced through meiosis. There are both internal and external types of fertilization and development.** **D. Identify the anatomy and physiology of human reproductive systems found in males and females.** **E. Know stages from human conception to fetal development.** **F. Know stages of human pregnancy: labor, delivery, and birth.**	• Discuss and observe binary fission, budding, regeneration, and parthenogenesis. Weigh pros and cons of single parent versus two parent reproduction. • Use pop-beads, models, or homemade flipbooks to deconstruct stages of mitosis. Provide examples of mitosis in the human body. Discuss cell cycle, cell death, and cancer • Use pop-beads, models, or homemade flipbooks to deconstruct stages of meiosis. *Can discuss crossing-over, non-disjunction, and genetic disorders. Use examples of other species to understand internal and external fertilization and development. • Use a Punnett square to show sex determination by chromosomes. • Use multiple diagrams to provide understanding of basic male parts and pathways of gametes as well as basic female parts and pathways of gametes. Include graphs and diagrams to understand the menstrual cycle and hormone changes that accompany it. • Use of media recommended. • Discuss technologies for genetic screening and prenatal monitoring.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 10: *Organisms carry out transport.*		
A. Understand that transport is a life function; cells carry out different types of transport. **B. Recognize structures and passageways as well as functions of the human circulatory system.**	• Offer laboratory activities and everyday examples of diffusion and facilitated diffusion as passive transport and introduce pumps (and/or contractile vacuoles) for active transport. • Offer laboratory activities involving exchange across membranes, such as the semi-permeable membrane of cells. Use indicators to show transport. • Compare circulatory systems and pumps between different organisms. • Perform laboratory activities involving breathing capacity, gas exchange, surface area, surface tension, and surfactants.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 11: *Organisms carry out respiration.*		
A. Understand that respiration is a life function; cells carry out gas exchange. **B. Recognize structures and passageways as well as functions of the human respiratory system.**	• Offer laboratory activities related to oxygen and carbon dioxide and their exchange across membranes, such as semi-permeable membrane of cells. • Compare respiratory systems of different organisms. Examine the balanced equation between photosynthesis and cellular respiration. *Discuss fermentation. • Perform laboratory activities that involve breathing capacity, surface area, surface tension, or surfactants.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 12: *Organisms carry out regulation.*		
A. Understand that regulation is a life function; cells carry out responses to stimuli. Humans have several sensory organs and several types of receptors. **B. Recognize how impulses are carried through neurons and nerves. Discuss differences between the human central and peripheral nervous systems.** **C. Recognize that the endocrine system is a form of communication throughout the body that utilizes hormones, receptors, and glands without ducts.**	• Explore various examples of stimulus and response. • Make models of neurons; compare types of neurons. • Learn parts and functions of a particular sensory organ. • Introduce the nervous system components; central and peripheral, and coordination between two in response to different types of stimuli. • Differentiate between electrical and chemical impulses as well as reflexes and more thoughtful responses. • Explore neurons and 3-D brain models using multimedia to examine representative abilities of the human brain; know the lobes and associated functions. • Dissect a sheep brain. • Introduce feedback loops through examples of glands, hormones, and effects. • Provide examples of hormones and the results of their messages (growth hormone, melatonin, glucagon/insulin, calcitonin/parathormone, FSH/LH, TSH/thyroxine), ACTH, ADH, among others. • Have students research and prepare presentations about disorders associated with hormone imbalances.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 13: ***Movement of humans occurs through the use of muscles and the skeleton.***		
A. Review cartilage and bone composition of the human body. **B. Introduce muscle: composition, types, and general purposes.** **C. Understand the physics of how joints work and the differences between ligaments and tendons.**		

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 14: *Organisms carry out digestion and excretion.*		
A. Understand that enzymes are crucial to living things and digestion is another place we can explore them. **B. Identify the difference between mechanical and chemical digestion.** **C. Recognize structures, the passageway, as well as functions of the human digestive system.** **D. Identify the various ways the human body excretes waste.**	• Reinforce that enzymes can be digestive or synthesizing. • Explore lock-n-key mechanisms of enzymes, substrates and products. • Carry out enzyme activities in the laboratory setting. • Compare mechanical and chemical digestion in the laboratory setting by performing the classic cracker or modern potato chip chewing activity. • Follow the journey of a meal as it enters and is processed by the digestive tract of the human. • Compare skin, lungs, and kidneys ; the functions carried out by each. • Explore sweating, excretion of carbon dioxide, and the diffusion in the kidney in the laboratory setting.	

Learning Standard	Ideas for Developing Investigations and Learning Experiences	Date Completed
Enduring Knowledge 15: *Organisms are connected to each other and to the world around them.*		
A. Identify imbalances between man and nature. **B. Recognize solutions to imbalances.**	• Offer problem-based learning experiences to students to first identify and then solve problems caused by the imbalances between man and nature. Examples of problems may include soil erosion, global warming, and acid rain. Solutions may include bioremediation and policy changes.	