Scientific Method

Missouri Grade-Level Expectations (or other standards)

7.1.A: Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation.
7.1.B: Scientific inquiry relies upon gathering evidence from qualitative and quantitative observation.
7.1.C: Scientific inquiry includes evaluation of explanations in light of evidence and scientific principles.
7.1.D: The nature of science relies upon communication of results and justification of explanations.

Learning Goal	Proficiency Scales
Students will be able to formulate a testable hypothesis, gather data, and draw a conclusion.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Applying the steps of the scientific method. ● Designing an experiment with an independent and dependent variable, and with an experimental and control group. ● Graphing data. ● Analyzing how the hypothesis is supported or rejected by the data. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as *dependent/independent variable, hypothesis, control/experimental group, and conclusion*. ● Performing processes such as: ○ Listing the steps of the scientific method. ○ Identifying from a teacher-provided lab the independent and dependent variables, the experimental and control groups. ○ Constructing a line graph.

	○ Deciding if the hypothesis is supported or rejected by the data. 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets
● Students list the steps of the scientific method. ● Students identify the independent and dependent variables from teacher-provided scenarios. ● Students identify the experimental and control group from teacher-provided scenarios. ● Students graph data. ● Students determine if the hypothesis is supported or rejected by the data. ● Students perform and write up lab report for designated lab.
Learning Design

Populations

Missouri Grade-Level Expectations (or other standards)
CLE 4.1.B: Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.

Learning Goal	Proficiency Scales
Students will relate population growth patterns to population change.	4. Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3. Student demonstrates mastery with the learning goal as

	evidenced by: ● Contrasting population growth graphs. ● Determining a population's carrying capacity with examples of density-dependent/density-independent limiting factors. ● Determining characteristics of r-strategist/k-strategist 2. Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as *population growth, exponential/boom and bust/logistic, carrying capacity, density-dependent/density-independent, and r-strategist/k-strategist.* ● Performing processes such as: ○ Identifying the four types of population growth graphs. ○ Defining r-strategist/k-strategist characteristics. 1: Student demonstrates a limited understanding or skill with the learning goal.

Mendelian Genetics

Missouri Grade-Level Expectations (or other standards)
3.3.E: The pattern of inheritance for many traits can be predicted by using the principles of Mendelian genetics.

Learning Goal	Proficiency Scales
Students will be able to apply the principles of Mendelian genetics to patterns of inheritance.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by:

	● Completing a dihybrid genetic cross using a Punnett square. ● Identifying 3 mechanisms that contribute to genetic variation. ● Explaining how sex chromosomes determine offspring gender for humans. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as *heredity, autosomal & sex chromosomes, dominant, recessive, heterozygous, homozygous, sex-linked, hybrids, alleles, phenotype, genotype, Punnett squares.* ● Performing processes such as: ○ Completing a monohybrid genetic cross using a Punnett square. ○ Explaining how sex chromosomes determine offspring gender for humans. 1: Student demonstrates a limited understanding or skill with the learning goal.

Ecosystems

Missouri Grade-Level Expectations (or other standards)
3.2.B: Photosynthesis and cellular respiration are complementary processes necessary to the survival of most organisms on Earth. 4.1.A All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem. 4.2.A As energy flows through the ecosystems, all organisms capture a portion of that energy and transform it to a form they can use.

Learning Goal	Proficiency Scales
Students will be able to analyze the	4: Student demonstrates an in-depth inference or advanced

interactions between organisms and their environment.	application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Assessing how changes in abiotic and biotic factors affect a habitat. ● Identifying and mapping the biotic and abiotic factors with a specific ecosystem and show the influences that humans have on that site. ● ~~Predicting the order of succession species.~~ ● Creating 3-level food web showing energy lost at each level. ● Tracing the interactions of the products and reactants of photosynthesis and cellular respiration. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as *ecology, ecosystem, biotic/abiotic, succession, producer, primary/secondary/tertiary consumer, omnivore/herbivore/carnivore, food chain, food web, symbiosis, parasitism, mutualism, commensalism, niche, predation, competition, carbon cycle, photosynthesis, cellular respiration.* ● Performing processes such as: ● Identifying biotic and abiotic factors. ● Identifying the correct order of succession of species. ● Creating a 2-level food web showing energy lost at each level. ● Defining the 3 types of symbiotic relationship. ● Labeling the reactants of photosynthesis and cellular respiration using a teacher-provided diagram. ● Identifying the type of symbiotic relationship from an example. 1: Student demonstrates a limited understanding or skill with the learning goal.

DNA Structure and Function

Missouri Grade-Level Expectations (or other standards)

3.2.E: Protein structure and function are coded by the DNA.
3.3.B: All living organisms have genetic material that carries hereditary information.

Learning Goal	Proficiency Scales
The student will be able to demonstrate how the structure and function of DNA determines an organism's traits.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal 3: Student demonstrates mastery with the learning goal as evidenced by: ● Tracing the contributions of Watson, Crick and Franklin to the discovery of DNA's function. ● Identifying major parts on a strand of DNA. ● Generating the end product of DNA replication if given the original strand. ● Describing the steps of gene expression. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as *adenine, guanine, cytosine, thymine, nucleotide, base pair, hydrogen bond, double helix, DNA, RNA, replication, transcription, translation, amino acids, codon, anticodon, protein synthesis, peptide bond, gene, trait.* ● Performing processes such as: ○ Labeling the base pairs in a strand of DNA. ○ Identifying the correct number of strands at the end of DNA replication. ○ Ordering the steps of gene expression. 1: Student demonstrates limited understanding or skill with the learning goal.

WGSD Curriculum -- Biology A
Cells

Missouri Grade-Level Expectations (or other standards)
3.1.C: Cells are the fundamental units of structure and function of all living things. 3.2.A: The cell contains a set of structures called organelles that interact to carry out life processes through physical and chemical means. 3.2.F: Cellular activities and responses can maintain stability internally while external condition are changing (homeostasis).

Learning Goal	Proficiency Scales
The student will be able to explain how cell organelles carry out life processes and homeostasis.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Stating the 3 parts of the cell theory ● Comparing and contrasting prokaryotic, eukaryotic, plant and animal cells. ● Identifying functions for all cell organelles. ● Labeling pictures of plant and animal cell organelles. ● Drawing and labeling the cell membrane. ● Predicting transport of molecules across the cell membrane based on size and polarity. 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing and recalling specific vocabulary, such as *cell theory, prokaryote, eukaryote, cell membrane, cell wall, chloroplast, chromosomes, cytoplasm, golgi apparatus, lysosome, mitochondria, nuclear membrane, nucleolus, nucleus, ribosomes, rough endoplasmic reticulum, smooth endoplasmic reticulum, vacuole, selectively permeable, phospholipid bilayer, homeostasis, passive and active transport, concentration gradient,*

	equilibrium, diffusion, osmosis, transport proteins, membrane pump, endocytosis, exocytosis, hypotonic, isotonic, hypertonic. ● Performing processes such as: ○ Recognizing the 3 parts of the cell theory. ○ Identifying prokaryotic, eukaryotic, plant and animal cells. ○ Matching cell organelles to their functions. ○ Labeling pictures of plant and animal cell organelles. ○ Stating the scientific name of the cell membrane and its basic characteristics. ○ Providing two examples of active and passive transport. 1: Student demonstrates a limited understanding or skill with the learning goal.

WGSD Curriculum -- Biology A
Cell Growth and Reproduction

Missouri Grade-Level Expectations (or other standards)
3.1.B: Organisms progress through life cycles unique to different types of organisms. 3.3.C: Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to daughter cells and from parents to offspring during reproduction.

Essential Learning Goal	Proficiency Scales
The student will be able to contrast the processes involved in and the end results of mitosis and meiosis.	4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. 3: Student demonstrates mastery with the learning goal as evidenced by: ● Differentiating among the 6 phases of mitosis.

	● Describing the G1,S,G2 phases of interphase and the 3 checkpoints. ● Contrasting cytokinesis in plant and animal cells of mitosis. ● Contrasting chromatids and homologous chromosomes of meiosis. ● Contrasting the end products of mitosis and meiosis (number of cells and number of chromosomes) in mitosis and meiosis. ● Creating a human life cycle diagram (that depicts diploid, haploid, mitosis, meiosis, fertilization, and zygote). 2: Student demonstrates he/she is nearing proficiency by: ● Recognizing or recalling specific vocabulary, such as *mitosis, meiosis, interphase, prophase, metaphase, anaphase, telophase, cytokinesis, chromosome, chromatid, homologous chromosomes, centomere, spindle fibers, diploid, haploid, gamete, zygote, sexual* and *asexual reproduction.* ● Performing processes such as: ○ Labeling cells in 6 phases of mitosis. ○ Defining chromatids and homologous chromosomes. ○ Contrasting cytokinesis in plant and animal cells. ○ Contrasting the end products of mitosis and meiosis (# of cells and # of chromosomes). ○ Labeling a teacher-provided human life cycle diagram. 1: Student demonstrates a limited understanding or skill with the learning goal.