MST-PBL Curriculum

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All students will apply an understanding of cells to the functioning of multicellular organisms, including how cells grow, develop and reproduce.

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	SCIENCE BENCHMARKS	MATH DISTRICT BENCHMARKS
CELLS	**KC:** Specialized functions of cells—respiration (see LO h-3), protein synthesis, mitosis, meiosis (see LH h-2). Basic molecules for cell growth—simple sugars, amino acids, and fatty acids. Basic chemicals, molecules and atoms—water, minerals, carbohydrates, proteins, fats and lipids, nucleic acids; carbon, hydrogen, oxygen, nitrogen. Cells come only from other cells. (See LO m-4, digestion.) **RWC:** The growth of plants and animals. **KC:** Classifications of organisms by cell type—plant, animal, bacteria; selected specialized plant and animal cells—red blood cells, white blood cells, muscle cells, nerve cells, root cells, leaf cells, stem cells; cell parts used for classification—organelle, nucleus, cell wall, cell membrane; specialized functions—reproduction (see LC h-1, LH h-2), photosynthesis (see LO m-3), transport; cell shape. **RWC:** Reproduction, growth, response, movement of animals and plants. Functions of bacteria.	**LC1:** Explain how multicellular organisms grow, based on how cells grow and reproduce. **LC2:** Compare and contrast ways in which selected cells are specialized to carry out particular life functions.	

MST-PBL Curriculum

Draft

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	SCIENCE BENCHMARKS	MATH DISTRICT BENCHMARKS
All students will use classification systems to describe groups of living things.			
LIVING THINGS	**KC:** Kingdom categories—protist, fungi, moneran, animal, plant. Characteristics for classification—cell wall, cell membrane, organelle, single-celled multicellular. **RWC:** Common local representatives of each of the five major kingdoms—Paramecium, yeast, mushroom, bacteria, frog, geranium.	**LO1:** Classify major groups of organisms to the kingdom level.	
All students will compare and contrast differences in the life cycles of living things.			
LIVING THINGS	**KC:** Infection process—disease, parasite, carrier, host, infection. **RWC:** Life cycle of organisms(s) associated with human disease(s), such as Lyme disease—tick, malaria—mosquito, parasites.	**LO2:** Describe the life cycle of an organism associated with human disease.	
All students will investigate and explain how living things obtain and use energy.			
LIVING THINGS	**KC:** Cellular respiration, photosynthesis (see LO m-3), oxygen, sunlight, carbon dioxide, carbohydrate, fat, protein, minerals, water. See LC h-1 (how organisms grow), LO m-3 (how plants store food) LO m-4 (how food and oxygen are distributed to cells), LEC m-2 (the sun as the ultimate source of energy for organisms) and PCM m-3 (energy transformations). **RWC:** Food storage, such as maple tree—maple sap; potato—starch; honeybee—honey; cow—beef milk. Weight gain and weight loss. Change in respiration rates with exercise.	**LO3:** Explain the process of food storage and food use in organisms.	**I-2-2:** Develop a mathematical concept of function and recognize that functions display characteristic patterns of change (e.g., linear, quadratic, exponential). **I-2-4:** Represent functions using symbolism such as matrices, vectors and functional representation (f(x)). **II-1-7:** Use shape, shape properties and shape relationships to describe the physical world and to solve problems. **II-3-2:** Continue to make and apply measurements of length, mass (weight), time, temperature, area, volume, angle; classify objects according to their dimensions. **II-1-2:** Determine necessary and sufficient conditions for the existence of a particular shape and apply those conditions to analyze shapes.

MST-PBL Curriculum

Draft

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	SCIENCE BENCHMARKS	MATH DISTRICT BENCHMARKS
All students will analyze how parts of living things are adapted to carry out specific functions.			
LIVING THINGS	**KC:** Related systems/cells/chemicals—excretory system, endocrine system, circulatory system, hormones, immune response, white blood cell, bacteria, virus. Factors/mechanisms under control—temperature, disease/infection, homeostasis. **RWC:** Mechanisms for maintaining internal stability, such as body temperature, disease control. **KC:** Available technologies— sanitation, adequate food and water supplies, inoculation, antibodies, biochemistry, medicines, organ transplants. (See PWV h-4, ultrasound/x-ray). **RWC:** Common contexts for these technologies—health maintenance and disease prevention activities, such as exercise and controlled diets; health monitoring activities, such as cholesterol and blood pressure checks and various tests for cancer.	**LO4:** Explain how living things maintain a stable internal environment. **LO5:** Describe technology used in the prevention, diagnosis, and treatment of diseases and explain its function in terms of human body processes.	
All students will investigate and explain how characteristics of living things are passed on through generations.			
GENETICS	**KC:** Traits— dominant, recessive. Genetic material— gene pair, gene combination, gene sorting. **RWC:** Common contexts— inheritance of a human genetic disease/disorder, such as sickle cell anemia; a family tree focused on certain traits; examining animal or plant pedigrees.	**LH1:** Explain how characteristics of living things are passed on from generation to generation.	**III-1-1:** Collect and explore data through observation, measurement, surveys, sampling techniques and simulations. **III-1-4:** Identify what data are needed to answer a particular question or solve a given problem and design and implement strategies to obtain, organize and present those data. **III-3-1:** Make and test hypotheses. **III-3-4:** Make predictions and decisions based on data, including interpolations and extrapolations. **III-3-3:** Formulate and communicate arguments and conclusions based on data and evaluate their arguments and those of others. **IV-2-5:** Select appropriate representations for numbers, including representations of rational and irrational numbers and coordinate and vector representations of complex numbers, in order to simplify and solve problems.

MST-PBL Curriculum

Draft

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	SCIENCE BENCHMARKS	MATH DISTRICT BENCHMARKS
	KC: Types of cell division— mitosis, meiosis. DNA replication, chromosome. Types of reproduction— sexual, asexual. Genetic variation. **RWC:** Fruit flies, yeast, reproduction by spores, cloning.	**LH2:** Describe how genetic material is passed from parent to young during sexual and asexual reproduction.	**I-1-1:** Analyze and generalize mathematical patterns including sequences, series, and recursive patterns.
All students will explain how new traits can be established by changing or manipulating genes.			
GENETICS	**KC:** Genetic changes— variation, new gene combinations, mutation. Natural and human-produced sources of mutation— radiation, chemicals. See LE m-2 (how new traits become established in populations). **RWC:** Products of genetic engineering, such as medical advances— insulin, cancer drugs; agricultural related products, such as navel oranges, new flower colors, higher-yield grains; effects of natural and man-made contamination; examples of variations due to new gene combinations, such as hybrid organisms or new plant varieties resulting from multiple sets of genes.	**LH3:** Explain how new traits may arise in individuals through changes in genetic material (DNA).	**III-1-1:** Collect and explore data through observation, measurement, surveys, sampling techniques and simulations. **III-1-4:** Identify what data are needed to answer a particular question or solve a given problem and design and implement strategies to obtain, organize and present those data. **III-3-1:** Make and test hypotheses. **III-3-3:** Formulate and communicate arguments and conclusions based on data and evaluate their arguments and those of others. **III-3-4:** Make predictions and decisions based on data, including interpolations and extrapolations. **IV-2-5:** Select appropriate representations for numbers, including representations of rational and irrational numbers and coordinate and vector representations of complex numbers, in order to simplify and solve problems.
All students will explain how scientists construct and scientifically test theories concerning the origin of life and evolution of species			
EVOLUTION	**KC:** Common types of evidence used— hominid fossils, vestigial structures, DNA, protein structure. **RWC:** Skeletal comparisons, such as modern human to hominid fossils, anatomical and biochemical similarities of humans and other higher primates, such as blood proteins; similarity of early human embryo stages to those of other vertebrates; vestigial structures, such as appendix, tall bone.	**LE1:** Describe what biologists consider to be evidence for human evolutionary relationships to selected animal groups.	

MST-PBL Curriculum

Draft

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	SCIENCE BENCHMARKS	MATH DISTRICT BENCHMARKS
All students will compare ways that living organisms are adapted (suited) to survive and reproduce in their environments and explain how species change through time.			
EVOLUTION	**KC:** Concept of species; how new species or varieties are established— natural selection, inheritable, non-inheritable characteristics, species variation. **RWC:** Contemporary examples of natural selection, such as bacteria resistance to antibiotics, insect resistance to pesticides; examples of artificial selection, such as agricultural selection to increase production, selecting desired traits for pets; examining pros and cons; historical examples of natural selection, such as possible evolution of the giraffe.	**LE2:** Explain how a new species or variety may originate through the evolutionary process of natural selection.	
All students will explain how parts of an ecosystem are related and how they interact.			
ECOSYSTEMS	**KC:** Competition, territory, carrying capacity, natural balance, population, dependence, survival; biotic, abiotic factors. **RWC:** Animals that live in packs or herds and plant colonies, such as— wolves, bison, lilies and other bulb plants, various forms of algae.	**LEC1:** Describe common ecological relationships between and among species and their environments.	**I-1-2:** Analyze, interpret and translate among representations of patterns including tables, charts, graphs, matrices and vectors. **I-1-3:** Study and employ mathematical and models of patterns to make inferences, predictions and decisions. **I-1-4:** Explore patterns (graphic, numeric, etc.) characteristic of families of functions; explore structural patterns within systems of objects, operations or relations. **I-1-5:** Use patterns and reasoning to solve problems and explore new content. **I-2-3:** Expand their understanding of function to include non-linear functions, composition of functions, inverses of functions, and piecewise and recursively defined functions. **I-2-4:** Represent functions using symbolism such as matrices, vectors and functional representation (f(x)). **I-2-5:** Differentiate and analyze classes of functions including linear, power, quadratic, exponential, circular and trigonometric functions, and realize that many different situations can be modeled by a

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			particular type of function. **IV-2-2:** Develop an understanding of more complex representations of numbers, including exponential and logarithmic expressions, and select an appropriate representation to facilitate problem solving. **IV-3-5:** Apply their understanding of number relationships in solving problems.
All students will explain how energy is distributed to living things in an ecosystem.			
ECOSYSTEMS	**KC:** Participants and relationships— food chain, food web, energy pyramid, energy flow, producers, consumers, decomposers. See LO m-3 (producers), PCM h-4 (conservation of energy). **RWC:** Energy pyramids for food webs in various ecosystems.	**LEC2:** Explain how energy flows through familiar ecosystems.	**I-1-2:** Analyze, interpret and translate among representations of patterns including tables, charts, graphs, matrices and vectors. **I-2-3:** Expand their understanding of function to include non-linear functions, composition of functions, inverses of functions, and piecewise and recursively defined functions.
All students will investigate and explain how communities of living things change over a period of time.			
ECOSYSTEMS	**KC:** Carrying capacity, competition, parasitism, predation, loss of habitat. **RWC:** Common factors that influence relationships, such as weather, disease, predation, migration.	**LEC3:** Describe general factors regulating population size in ecosystems.	**I-2-2:** Develop a mathematical concept of function and recognize that functions display characteristic patterns of change (e.g., linear, quadratic, exponential). **I-1-3:** Study and employ mathematical and models of patterns to make inferences, predictions and decisions. **I-1-4:** Explore patterns (graphic, numeric, etc.) characteristic of families of functions; explore structural patterns within systems of objects, operations or relations. **I-1-5:** Use patterns and reasoning to solve problems and explore new content. **I-2-4:** Represent functions using symbolism such as matrices, vectors and functional representation (f(x)). **I-2-3:** Expand their understanding of function to

MST-PBL Curriculum

Draft

UNIT TITLE	CORE TOPICS (Key Concepts & Real World Contexts)	SCIENCE BENCHMARKS	MATH DISTRICT BENCHMARKS
			include non-linear functions, composition of functions, inverses of functions, and piecewise and recursively defined functions. **I-2-6:** Increase their use of functions and mathematical models to solve problems in context. **IV-3-5:** Apply their understanding of number relationships in solving problems. **IV-2-2:** Develop an understanding of more complex representations of numbers, including exponential and logarithmic expressions, and select an appropriate representation to facilitate problem solving.
	KC: Succession, pioneer, climate/physical conditions, introduction of new/different species, elimination of existing species, biodiversity; cataclysmic changes. **RWC:** Climax forests comprised of maple, beech, or conifers; effects of urban sprawl or clear cutting forests; effects of cataclysmic changes such as the eruption of Mt. St. Helens.	**LEC4:** Describe responses of an ecosystem to events that cause it to change.	
All students will describe how materials cycle through an ecosystem and get reused in the environment.			
ECOSYSTEMS	**KC:** Common nutrients/elements— nitrogen, sulfur, carbon, phosphorous. Inorganic compounds containing nutrients— soil minerals, carbon dioxide. Organic compounds in living communities— proteins, fats, carbohydrates. See LO h-3 (cell respiration) and LO m-3 (photosynthesis). **RWC:** Movement of food materials through various food webs, including decomposition.	**LEC5:** Describe how carbon and soil nutrients cycle through selected ecosystems.	
All students will analyze how humans and the environment interact.			
ECOSYSTEMS	**KC:** Common factors that influence ecosystems, such as pollution of ecosystems from fertilizer, insecticide, and other chemicals. Land management, biodiversity, sustainability. Loss of habitat. See PME h-1 (risk/benefit analysis), EH h-2 (water pollution).	**LEC6:** Explain the effects of agriculture and urban development on selected ecosystems.	

MST-PBL Curriculum

Draft

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All students will describe how water moves.			
HYDROSPHERE	**KC:** Drainage basins, divides, reservoirs, tributaries, run-off. **RWC:** Local and regional watersheds, Great Lakes Basin, Continental Divide.	**EH1:** Identify and describe regional watersheds.	
All students will analyze the interaction of human activities with the hydrosphere.			
HYDROSPHERE	**KC:** Human activities— agriculture, fishing, manufacturing, energy production. Quantity of water— rate of use, urbanization. Oceans— oil spills, garbage, global warming, marine life. Freshwater pollution— industrial waste disposal, agricultural run-off, herbicides, pesticides, sewage, acid rain, nutrient levels. Ground water— landfills, leaching, disposal of toxic wastes. Purification technology— filtering, chlorination. Limits to natural resources. **RWC:** Examples of local and regional human activities that have measurable effects on water, including farming, industry, sewage disposal, toxic waste disposal.	**EH2:** Describe how human activities affect the quality of water in the hydrosphere.	

MST-PBL Curriculum

Draft

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NUMBER SENSE AND NUMERATION			**IV-1-1:** Develop an understanding of irrational, real and complex numbers. **IV-1-2:** Use the (a+bi) and polar forms of complex numbers. **IV-1-3:** Develop an understanding of the properties of the real and complex number systems and of the properties of special numbers including $\sqrt{1}$, i, e, and conjugates. **IV-1-4:** Apply their understanding of number systems to model, and solve mathematical and applied problems. **IV-2-5:** Select appropriate representations for numbers, including representations of rational and irrational numbers and coordinate and vector representations of complex numbers, in order to simplify and solve problems. **IV-3-4:** Express number relationships using positive and negative rational exponents, logarithms and radicals.
NUMBER SENSE AND NUMERATION			**V-1-1:** Present and explain geometric and symbolic models for operations with real and complex numbers and algebraic expressions. **V-1-2:** Compute with real numbers, complex numbers, algebraic expressions, matrices and vectors using technology and, for simple instances, with paper-and-pencil algorithms. **V-1-3:** Describe the properties of operations with numbers, algebraic expressions, vectors and matrices, and make generalizations about the properties of given mathematical systems.

MST-PBL Curriculum

Draft

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NUMBER SENSE AND NUMERATION			**V-2-1:** Identify important variables in a context, symbolize them and express their relationships algebraically. **V-2-2:** Represent algebraic concepts and relationships with matrices, spreadsheets, diagrams, graphs, tables, physical models, vectors, equations and inequalities; and translate among the various representations. **V-2-3:** Solve linear equations and inequalities algebraically and non-linear equations using graphing, symbol-manipulating or spreadsheet technology; and solve linear and non-linear systems using appropriate methods. **V-2-5:** Explore problems that reflect the contemporary uses of mathematics in significant contexts and use the power of technology and algebraic and analytic reasoning to experience the ways mathematics is used in society.
GEOMETRY AND MEASUREMENT			**II-1-1:** Use shape to identify plane and solid figures, graphs, loci, functions and data distributions. **II-1-2:** Determine necessary and sufficient conditions for the existence of a particular shape and apply those conditions to analyze shapes. **II-1-3:** Use transformational, coordinate or synthetic methods to verify (prove) the generalizations they have made about properties of classes of shapes. **II-1-4:** Draw and construct shapes in two and three dimensions and analyze and justify the steps of their constructions. **II-1-6:** Compare and analyze shapes and formally establish the relationships among them, including congruence, similarity, parallelism, perpendicularity and incidence. **II-1-7:** Use shape, shape properties and shape relationships to describe the physical world and to solve problems.

MST-PBL Curriculum

Draft

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			II-3-2: Continue to make and apply measurements of length, mass (weight), time, temperature, area, volume, angle; classify objects according to their dimensions. **II-3-5:** Use proportional reasoning and indirect measurements, including applications of trigonometric ratios, to measure inaccessible distances and to determine derived measures such as density.