"I Can¨ Mascoma Science Grade 7 Curriculum

I Have Good SCIENTIFIC SKILLS

☐ I can observe and ask questions about scientific topics.

☐ I can build and revise a simple model to represent events and design solutions.

☐ I can develop a model to describe or represent scientific phenomena.

☐ I can plan and carry out a scientific investigation to answer a question or solve a problem.

☐ I can produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered.

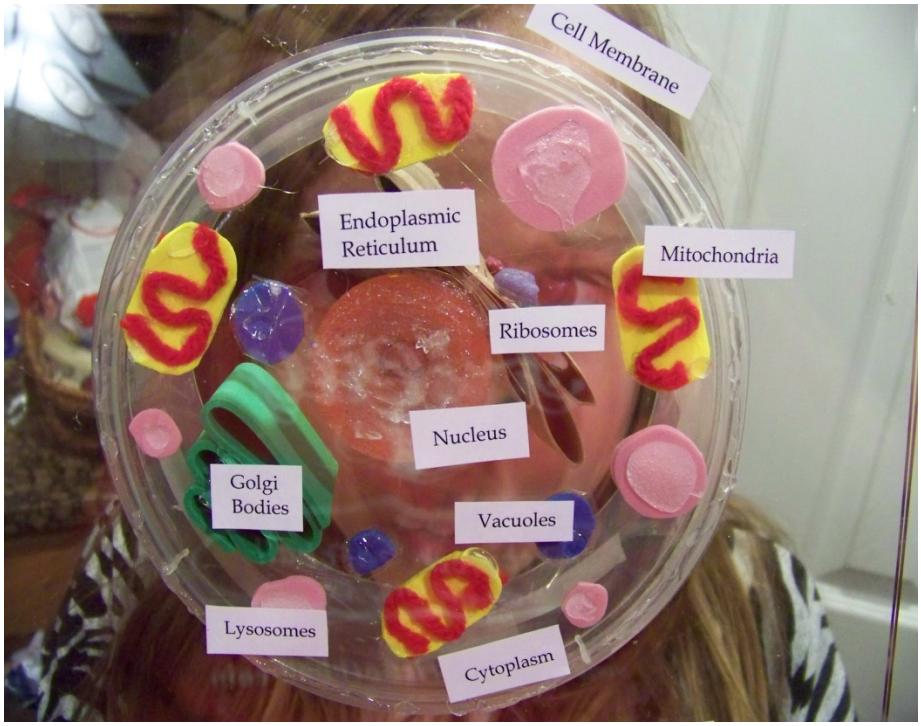
☐ I can make observations and measurements to produce data to serve as the basis for evidence for the explanation of a phenomenon.

☐ I can measure and graph quantities such as weight and length to address scientific and engineering questions and problems.

☐ I can explain the results of a scientific investigation.

I know about the Structures and Processes of Molecules to Organisms

☐ I can conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells (Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many, varied cells).



☐ I can develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function(Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Assessment Boundary: Assessment of organelle structure/ function is limited to the cell wall and membrane. Assessment of the function of other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of the cell or cell parts).

☐ I can use an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells (Emphasis is on the conceptual understanding that cells form tissues, and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems. Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems).

☐ I can use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively (Examples of behaviors that affect the probability of animal reproduction could include nest building to protect your from cold, herding of animals to protect the young from predators, and vocalizations of animals or colorful plumage to attract mates for breeding. Examples of animal behavior that affect the probability of plant reproduction include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers to attract butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and biodegradable shells on nuts that some animals bury.

☐ I can conduct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms (Examples of environmental conditions include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth and fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than in small ponds. Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes).

☐ I can construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms (Emphasis is on tracing movement of matter and flow of energy. Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis).

☐ I can develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism (Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration).

☐ I can gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories (Assessment Boundary: assessment does not include mechanisms for the transmission of this information).

A little primer for my teacher:

Common Core	RIST.7.1- Cite textural evidence to support analysis of what the test says explicitly as well as inferences drawn from the text.	RIST.7.2- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
	RIST.7.8- Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.	WHST.7.1- Write arguments focused on discipline content
	WHST.7.2- Write informative/ explanatory texts to examine a topic and convey ideas through the selection, organization, and analysis of relevant content.	WHST.7.3- Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
	WHST.7.8- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.	WHST.7.9- Draw evidence form informational texts to support analysis, reflection, and research.
	SL-7.5- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest	EE.C-7.9- Use two variables to represent quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the

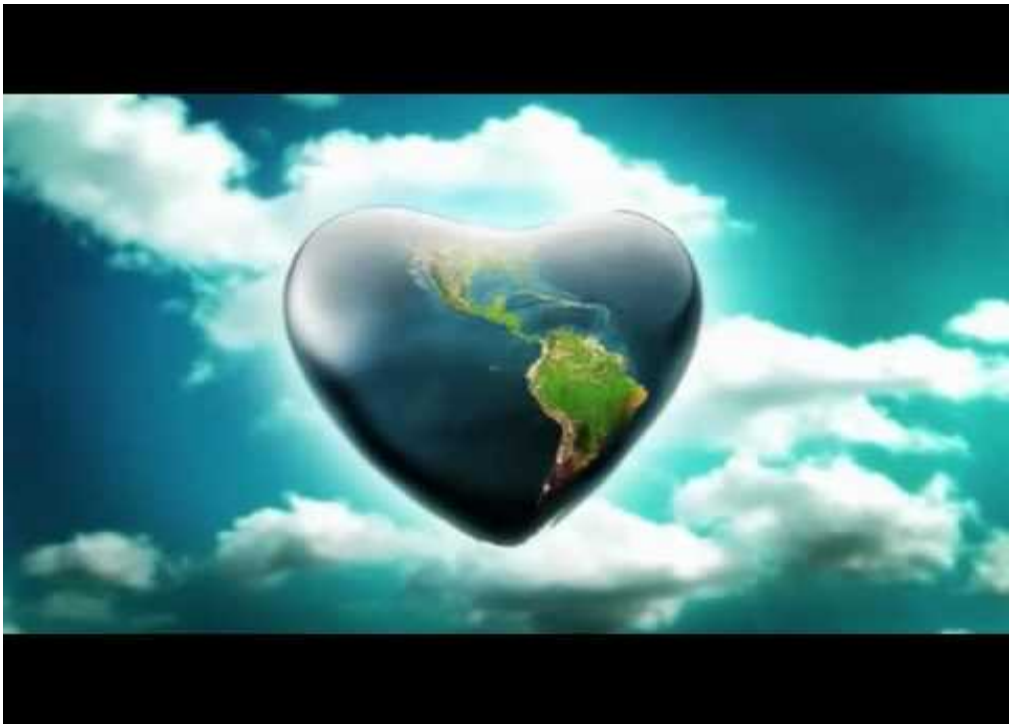
		independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
	SP.A-7.1- Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	SP.B-7.4- Summarize numerical data sets in relation to their context.
Vocabulary	Cells, function of a cell, nucleus, chloroplasts, mitochondria, cell membrane, cell wall, organelle, interacting system, tissues, organs, sub-system, circulatory, excretory, digestive, respiratory, muscular, nervous, reproductive, characteristic animal behavior, specialized plant structure, germination, vocalization, plumage, genetic, flow of energy, molecules, photosynthesis	
Disciplinary Core Ideas	Structure and Function • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular) • Within cells special structures are responsible for particular functions, and the cell membrane forms that boundary that controls what enters and leaves the cell. • In multicellular organisms, the body is a system of multiple interacting sub-systems. These are groups of cells that work together to form tissues and organs that are specialized for particular body functions. Growth and Development of Organisms • Animals engage in characteristic behaviors that increase the odds or reproduction • Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction • Genetic factors as well as local conditions affect the growth of the adult plant Organization for Matter and Energy Flow in Organisms • Plants, algae (including phytoplankton), and many micro-organisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use	

	• Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy <u>Information Processing</u> • Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical) transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories <u>Energy in Chemical Processes and Everyday Life</u> • The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., sunlight) to occur. In this reaction carbon dioxide and water combine to form carbon-based organic molecules and release oxygen • Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials
Cross-cutting Concepts	<u>Cause and Effect</u> • Cause and effect relationships may be used to predict phenomena in natural systems • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described by using probability <u>Scale, Proportion and Quantity</u> • Phenomena that can be observed at one scale may not be observable at another scale <u>Systems and System Models</u> • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems <u>Energy and Matter</u> • Matter is conserved because atoms are conserved in physical and chemical processes • Within a natural system, the transfer of energy drives the motion and/or cycling of matter <u>Structure and Function</u> • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structure/ systems can be analyzed to determine how they function <u>Interdependence of Science, Engineering, and Technology</u> • Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.

	<u>Science is a Human Endeavor</u> • Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas
Science and Engineering Practice	• Develop and use a model to describe phenomena • Develop a model to describe unobservable mechanisms • Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation • Construct a scientific explanation based on valid and reliable evidence obtained from sources and the assumption that theories and laws that describe the natural world operate as they did so in the past, and will continue to do so in the future • Use an oral and written argument supported by evidence to support or refute an explanation or by a model for a phenomena • Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods uses, and describe how they are supported or not supported by evidence. • Scientific knowledge is based upon logical connections between evidence and explanations

I Know About Ecosystems: Interactions, Energy and Dynamics

☐ I can analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem (Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers or organisms in ecosystems during periods of abundant and scarce resources).



☐ I can construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems (Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. The types of interactions include competitive, predatory, and mutually beneficial).

☐ I can develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem (Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system. Assessment Boundary- does not include chemical reactions to describe the process).

☐ I can construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations (Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

☐ I can evaluate competing design solutions for maintaining biodiversity and ecosystem services (Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations).

A little primer for my teacher:

Common Core	RIST.7.1- Cite textural evidence to support analysis of what the test says explicitly as well as inferences drawn from the text.	RIST.7.7- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flowchart, diagram, model, graph, or table).

	RIST.7.8- Distinguish among facts, reasoned judgment based on research finding, and speculation in a text.	RI.7.8- Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
	WHST.7.1- Write arguments to support claims with clear reasons and relevant evidence.	WHST.7.2- Write informative/ explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
	WHST.7.9- Draw evidence from literary or informational texts to support analysis, reflection, and research.	SL.7.1- Engage effectively in a range of collaborative discussions (one-to-one, in groups, and teacher led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
	SL.7.4- Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details. Use appropriate eye contact, adequate volume, and clear pronunciation.	SL.7.5- Include multi-media components (graphics, images, sounds, music) and visual displays in presentations to clarify information.
	MP-7.4- Model with mathematics.	RP.A-7.3- Use ratio and rate reasoning to solve real world and mathematical problems.
	EE.C-7.9- Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between dependent and independent variables using graphs and tables, and relate these	SP.B-7.5- Summarize numerical data sets in relation to their context.

	to the equation, and construct simple equations.	
Vocabulary	Resource, availability, ecosystem, abundant, scarce, abiotic, competitive, predatory, mutually beneficial, conservation of matter, population change, empirical evidence, water purification, nutrient recycling, social considerations, biodiversity	
Disciplinary Core Ideas	<u>Interdependent Relationships in Ecosystems</u> • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors • In an ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may complete with each other for limited resources, access to which consequently constrains their growth and reproduction • Growth of organisms and population increases are limited by access to resources • Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contract, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. <u>Cycle of Matter and Energy Transfer in Ecosystems</u> • Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. <u>Ecosystem Dynamics, Functioning, and Resilience</u> • Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	

	• Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. <u>Biodiversity and Humans</u> • Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on-for example, water purification and recycling. <u>Developing Possible Solutions</u> • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
Cross-cutting Concepts	<u>Patterns</u> • Patterns can be used to identify cause and effect relationships <u>Cause and Effect</u> • Cause and effect relationships may be used to predict phenomena in natural or designed systems <u>Energy and Matter</u> • The transfer of energy can be tracked as energy flows through a natural system <u>Stability and Change</u> • Small changes in one part of a system might cause large changes in another part
Science and Engineering Practice	• Develop a model to describe phenomena • Analyze and interpret data to provide evidence for phenomena • Construct a scientific explanation that includes qualitative and quantitative relationship between variables that predict phenomena • Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria • Science disciplines share common rules of obtaining and evaluating empirical evidence

I Know About Heredity: Inheritance and Variation of Traits

☐ I can develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism (Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins. Assessment Boundary: Does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations).

☐ I can develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation (Emphasis is on using models such as Punnett Squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parents to offspring and resulting genetic variation).

A little primer for my teacher:

Common Core	RST.7.1- Cite textural evidence to support analysis of what the test says explicitly as well as inferences drawn from the text.	RST.7.4- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grade 7 texts and topics.
	RST.7.7- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flowchart, diagram, model, graph, or table).	SL.7.5- Include multi-media components (graphics, images, sounds, music) and visual displays in presentations to clarify information.
	MP-7.4- Model with mathematics.	SP.B-7.5- Summarize numerical data sets in relation to their context.

Vocabulary	Genes, mutations, proteins, chromosomes, Punnett Squares, sexual, asexual, genetic variation, alleles, inherited, trait
Disciplinary Core Ideas	<u>Growth and Development of Organisms</u> • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. <u>Inheritance of Traits</u> • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions on the organism and thereby change traits • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. <u>Variations of Traits</u> • In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from one another • In addition to variations that arise from sexual reproduction, genetic information may be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.
Cross-cutting Concepts	<u>Cause and Effect</u> • Cause and effect relationships may be used to predict phenomena in natural or designed systems <u>Structure and Function</u> • Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.
Science and Engineering Practice	• Develop and use a model to describe phenomena.

I Know Biological Evolution: Unity and Diversity

Natural Selection

- Mutations
- Some diversity comes from mutations
- Beneficial mutations are passed on
- Mutations can become part of genes
- Example: Giraffes' long necks

JRobertMoore, Giraffe, January 13, 2007, Creative Commons License

☐ I can analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past (assessment does not include the names of individual species or geological eras in the fossil record).

☐ I can apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships (emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures).

☐ I can analyze displays of pictorial data to compare patterns of similarities on the embryological development across multiple species to identify relationships not evident in the fully formed anatomy (emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures).

☐ I can construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment (emphasis is on using simple probability statements and proportional reasoning to construct explanations).

☐ I can gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms (emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection, such as genetic modification, animal husbandry, and gene therapy; and on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries).

☐ I can use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time (emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time).

A little primer for my teacher:

Common Core	RIST.7.1- Cite textural evidence to support analysis of what the test says explicitly as well as inferences drawn from the text.	RIST.7.7- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (in a flowchart, diagram, model, graph, or table).
	RIST-7.9- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic	WHST.7-2- Write informative/ explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
	WHST.7-8- Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusion of others while avoiding plagiarism and providing basic bibliographic information for sources.	WHST.7-9- draw evidence from informational texts to support analysis, reflection, and research.

	SL.7.1- Engage effectively in a range of collaborative discussions (one on one, small group, teacher led) with diverse partners on grade 7 topics, texts, and issues; building on others' ideas and expressing their own clearly.	SL.7.4- Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation
	MP-7.4- Model with mathematics.	RP.7-A-1- understand the concept of ratio and use ratio language to describe a ration relationship between two quantities
	RP.7.A-2- Recognize and represent proportional relationships between quantities.	SP.B-7.5- Summarize numerical data sets in relation to their context.
	EE.7.B-6- Use variables to represent numbers and write expressions when solving a real-world mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	
Vocabulary	Fossil record, existence, diversity, extinction, life forms, natural laws, anatomical similarities, evolutionary, embryological, species, anatomy, genetic variations, traits, population, probability, surviving, reproducing, human influence, inheritance, natural selection	
Disciplinary Core Ideas	Evidence of Common Ancestry and Diversity • The collection of fossils and their placement in chronological order (through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. • Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. • Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy. Natural Selection • Natural selection leads to the predominance of certain traits in a population, and the suppression of others.	

	• In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. Adaptation • Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.
Cross-cutting Concepts	Cause and Effect • Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability Patterns • Patterns can be used to identify cause and effect relationships • Graphs, charts, and images can be used to identify patterns in data Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in every field of science, and scientific discoveries have led to the development of entire industries and engineered systems Nature of Science • Science assumes that objects and events in natural systems occur in consistent patterns and are understandable through measurement and observation • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society makes
Science and Engineering Practice	Analyzing and Interpreting Data • Analyze displays of data to identify linear and nonlinear relationships • Analyze and interpret data to determine similarities and differences in findings Using Mathematics and Computational Thinking • Use mathematical representations to support scientific conclusions and design solutions Constructing Explanations and Designing Solutions • Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events • Construct an explanation that includes qualitative and/or quantitative relationships between variables that describe phenomena Obtaining, Evaluating, and Communicating Information

	• Gather, read, and synthesize information from multiple, appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence <u>Connections to Nature of Science</u> • Scientific knowledge is based upon logical and conceptual connections between evidence and explanations