MASSACHUSSETS MODEL CURRICULUM MAP

Life Science – Middle School

In Grade 6-8 Life Science, students will become engaged as scientists to better understand scientific inquiry. Students will study patterns, processes, and relationships of cells, plants, animals and humans leading to both the unity and the diversity of life on Earth.

This sample map illustrates one way to organize the Core Ideas of Life Science. Included in the map are middle level Life Science Core Ideas, Grade 6-8 College and Career Ready English Language Arts Anchor Standards for Reading Information and Writing appropriate to support instructional activities for student learning and college and career readiness, and the eight Science and Engineering Practices.

The map is organized around five core ideas that represent basic life sciences fields of investigation:

- Cell Structures, Function, and Use of Energy hinges on the unifying principle that cells are the basic unit of life. Cells carry out the basic functions of life and require energy to stay alive;
- Growth and Development and Reproduction of Organisms address how individual organisms are configured and how these structures function to support life, growth, behavior, and reproduction;
- Natural Selection and Adaptations describes how variation of genetically determined traits in a population may give some members a reproductive advantage in a given environment;
- Matter and Energy in Organisms and Ecosystems explores the cycling of matter and the flow of energy within ecosystems resulting from interactions among different organisms and between organisms and the physical environment; and
- Interdependent Relationships in Ecosystems describes how organisms obtain resources, how they change their environment, how changing environmental factors affect organisms and ecosystem functioning.

Within each of the five core areas, the applicable Science Practices can be found. Students in Grades 6-8 should continue to develop proficiency in the eight Science Practices intended to cultivate students' scientific habits of mind, develop their capability to engage in scientific inquiry, and teach them how to reason in a scientific context helps students understand how scientific knowledge develops.

1. Asking questions
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Sample Unit titles will be added to the "Unit Column" as they are created and Curriculum- Embedded performance assessments (CEPA) that belong with each model curriculum unit will be added in the "Assessment Column".

Grade 6-8 Life Science Map			
Month	**Content**	**Curriculum Unit**	**Assessment**
August/ Mid September	Introduction: What is Science? Science Practices, Safety Procedures, Science vocabulary Measurement, Equipment		
Mid September through November	MS.LS-SFIP Structure, Function, and Use of Energy LS1.A: Structure and Function LS1.D: Information Processing LS1.C: Organization for Matter and Energy Flow in Organisms	Cells & Energy	Curriculum-Embedded Performance Assessments TT1. Cell Model TT2. Journey of an Oxygen Molecule
December/ Mid January	MS.LS-GDRO Growth, Development, and Reproduction of Organisms LS1.B: Growth and Development of Organisms Reproduction LS3.A: Inheritance of Traits Genetics LS3.B: Variation of Traits		
Mid January / February	MS.LS-NSA Natural Selection and Adaptations LS4.A: Evidence of Common Ancestry and Diversity LS4.B: Natural Selection LS4.C: Adaptation		
March	MS.LS- MEOE Matter and Energy in Organisms and Ecosystems LS2.B: Cycle of Matter and Energy Transfer in Ecosystems LS2.C: Ecosystem Dynamics, Functioning, and Resilience		
April/May	MS.LS-IRE Interdependent Relationships in Ecosystems LS2.A: Interdependent Relationships in Ecosystems LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS2.D: Social Interactions and Group Behavior LS4.D. Biodiversity and Humans		

TIME	SCIENCE STANDARDS	CURRICULUM UNIT CONNECTIONS	ASSESSMENTS
August- Mid September	Introduction: What is Science? Science Practices Procedures Science vocabulary Measurement Equipment		Pre-assessment
Mid September – November	MS.LS Cell Structure, Function, and Use of Energy LS1.A: 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) ☐Unicellular organisms (microorganisms), like multicellular organisms, need food, water, a way to dispose of waste, and an environment in which they can live. ☐Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. ☐In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.	Cells & Energy	Curriculum-Embedded Performance Assessments TT1. Cell Model

Mid September – November	MS.LS Cell Structure, Function, and Use of Energy (cont.) LS1.C: Organization for Matter and Energy Flow in Organisms ☐ Plants, algae (including phytoplankton), and many microorganisms 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. ☐ Animals obtain food from eating plants or eating other animals. ☐ 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. ☐ In most animals and plants, oxygen reacts with carbon-containing molecules (sugars) to provide energy and produce carbon dioxide; anaerobic bacteria achieve their energy needs in other chemical processes that do not need oxygen. Science and Engineering Practices • Developing and Using Models • Planning and carrying Out Investigations • Constructing explanations and Designing Solutions • Obtaining, Evaluation and Communication Information ELA Connections RST3 Follow precisely a multistep procedure when		TT2. Journey of an Oxygen Molecule

Mid September – November	carrying out experiments, taking measurements, or performing technical tasks MS.LS Cell Structure, Function, and Use of Energy (cont.) RST4 Determine meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding 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 4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose and audience. Mathematics Connections MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision		
December/ Mid January	LS1.B: Growth and Development of Organisms ☐ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. ☐ Animals engage in characteristic behaviors that increase the odds of reproduction. ☐ Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features (such as		

December/ Mid January	attractively colored flowers) for reproduction. ☐ Plant growth can continue throughout the plant's life through production of plant matter in photosynthesis. LS1.B: Growth and Development of Organisms (cont.) ☐ Genetic factors as well as local conditions affect the size of the adult plant. The growth of an animal is controlled by genetic factors, food intake, and interactions with other organisms, and each species has a typical adult size range. LS3.A: Inheritance of Traits ☐ 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 (e.g., human skin color results from the actions of proteins that control the production of the pigment melanin). ☐ Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. ☐ Sexual reproduction provides for transmission of genetic information to offspring through egg and sperm cells. These cells, which contain only one chromosome of each parent's chromosome pair, unite to form a new individual (offspring). Thus offspring possess one instance of each parent's chromosome pair (forming a new chromosome pair). Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited or (more rarely) from mutations. LS3.B: Variation of Traits ☐ In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring.		

December/ Mid January	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 each other. LS1.B: Growth and Development of Organisms (cont.) ☐ In addition to variations that arise from sexual reproduction, genetic information can 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. Science and Engineering Practices • Developing and Using Models • Planning and Carrying Out Investigations • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information ELA Connections W.7.1 Write argument to support claims with clear reasons and relevant evidence. WHST.7 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. Mathematics Connections MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others.		

Mid January / February	MS.LS-NSA Natural Selection and Adaptations LS4.A: Evidence of Common Ancestry and Diversity ☐ Fossils are mineral replacements, preserved remains, or traces of organisms that lived in the past. Thousands of layers of sedimentary rock not only provide evidence of the history of the Earth itself but also of changes in organisms whose fossil remains have been found in those layers. ☐ The collection of fossils and their placement in chronological order (e.g., 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. Because of the conditions necessary for their preservation, not all types of organisms that existed in the past have left fossils that can be retrieved. ☐ 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.		

Mid-January – February	LS4.B: Natural Selection ☐ Genetic variations among individuals in a population give some individuals an advantage in surviving and reproducing in their environment. This is known as natural selection. It 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. MS.LS-NSA Natural Selection and Adaptations (cont.) LS4.C: 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. ☐ In separated populations with different conditions, the changes can be large enough that the populations, provided they remain separated (a process called reproductive isolation), evolve to be separate species. Science and Engineering Practices ☐ Analyzing and Interpreting Data ☐ Using Mathematics and computational thinking ☐ Constructing Explanations and Designing Solutions ☐ Obtaining, Evaluating, and Communicating Information ELA Connection SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts,		

	details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation. Mathematics Connections MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.4 Model with mathematics.		
March	MS.LS-MEOE Matter and Energy in Organisms and Ecosystems LS2.B: Cycle of Matter and Energy Transfer in Ecosystems ☐ Food webs are models that demonstrate how matter and energy is transferred between producers (generally plants and other organisms that engage in photosynthesis), consumers, and decomposers as the three groups interact—primarily for food—within an ecosystem. Transfers of matter into and out of the physical environment occur at every level—for example, when molecules from food react with oxygen captured from the environment, the carbon dioxide and water thus produced are transferred back to the environment, and ultimately so are waste products, such as fecal material. 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. LS2.C: Ecosystem Dynamics, Functioning, and Resilience ☐ 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		

March	populations. Science and Engineering Practices ☐ Developing and Using Models ☐ Planning and carrying Out Investigations ☐ Constructing explanations and Designing Solutions ☐ Engaging in Argument from Evidence MS.LS-MEOE Matter and Energy in Organisms and Ecosystems (cont.) ELA Connection W.7.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. Mathematics Connections MP.3 Construct viable arguments and critique the reasoning of others. MP.4 Model with mathematics.		
April – May	MS.LS-IRE Interdependent Relationships in Ecosystems LS2.A: Interdependent Relationships in Ecosystems ☐ Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. Growth of organisms and population increases are limited by access to resources. In any ecosystem, organisms and populations with similar requirements for food,		MCAS 2013 in Science, Technology/Engineering (STE), gr. 8, May 7-21, two sessions, 45 mins.

April – May	water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. ☐ Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, 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. MS.LS-IRE Interdependent Relationships in Ecosystems (cont.) LS2.C: Ecosystem Dynamics, Functioning, and Resilience ☐ 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. LS2.D: Social Interactions and Group Behavior ☐ Groups may form because of genetic relatedness, physical proximity, or other recognition mechanisms (which may be species-specific). They engage in a variety of signaling behaviors to maintain the group's integrity or to warn of threats. Groups often dissolve if they no longer function to meet individuals' needs, if dominant members lose their place, or if other key members are removed from the group through death, predation, or exclusion by other members. LS1.D: Information Processing ☐Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical); transmitting them as signals that travel along nerve cells to the brain.		

April – May	☐The signals are then processed in the brain, resulting in immediate behaviors or memories. Changes in the structure and functioning of many millions of interconnected nerve cells allow combined inputs to be stored as memories for long periods of time. LS4.D: Biodiversity and Humans ☐ Biodiversity is the wide range of existing life forms that have adapted to the variety of conditions on Earth from terrestrial to marine ecosystems. Biodiversity includes genetic variation within a species, in addition to species variation in different habitats and ecosystem types (e.g., forests, grasslands, wetlands). MS.LS-IRE Interdependent Relationships in Ecosystems (Cont.) ☐ 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. Science and Engineering Practices ☐ Asking Questions and Defining Problems ☐ Developing and Using Models ☐ Constructing Explanation and Designing Solutions ☐ Engaging in Argument from Evidence ELA Connections SL.7.3 Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence. WHST.7 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. Mathematics Connection MP.3 Construct viable arguments and critique the reasoning of others.		