Life Science

Grade 7 Prerequisite: Earth Science

ABSTRACT

Life Science introduces an extensive inquiry approach to the study of the nature of living things. Students are provided with a comprehensive up-to-date approach to modern biological trends. Students are introduced to fundamental concepts of life science that form a foundation upon which to build their science knowledge base for future study. The program provides students with the conceptual framework, factual knowledge, and analytical skills necessary to investigate and understand the composition and interactions of living things.

Adopted by the Somerville Board of Education on July 25, 2017
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**Essential Question:**
- What are the characteristics of all living things?
- How are organisms related in nature?
- How are the needs of the organism met?

**Content:**
- Compare and Contrast Characteristics of Living Things
- Life Cycles and Flow of Energy through Ecosystems
- Eukaryotic Cells’ Structure and Function

**Skills and Topics:**
- **September/October**
  - make observations on a living organism noting daily changes in a journal
  - justify examples of the common characteristics of life
  - illustrate the flow of energy through a community (CAD)*
  - identify the process of photosynthesis as the chemical process transforming radiant energy into chemical energy forming the basis of the food chain for the community
  - predict the impact that altering biotic and abiotic factors have on an ecosystem (CAD)
  - compare sexual versus asexual reproduction as mechanisms of variation and change between parents and offspring
  - demonstrate direct evidence of development and response to stimuli
  - relate the energy and nutritional needs of organisms in a variety of life stages and situations, including stages of development and periods of maintenance (CAD)
  - analyze the components of a consumer’s diet and trace them back to plants and plant products (CAD)
- **November/December**
  - delineate the trophic levels within an energy pyramid, food chain, and food web
  - explain the concentration of energy at the top with more biotic potential
  - explain interactions among organisms of different species in symbiotic relationships (CAD):
    - producer/consumer
    - predator/prey
    - parasite/host
    - scavenger/prey
    - decomposer/prey
  - discuss behavioral and/or inherited mechanisms allowing organisms to survive in their environment
  - describe how one population of organisms may affect other plants and/or animals in an ecosystem (CAD)
  - explain the impact of meeting human needs and wants on local and global environments (CAD)
  - investigate the role of human beings in the protection of the environment
  - model the interdependence of the human body’s major systems in regulating its internal environment (CAD)
  - trace energy through a food chain
- **January**
  - view protists using a microscope
  - discuss the methods by which a single-celled organism performs the tasks common to all living things
  - compare the benefits and limitations of existing as a single-celled organism and as a multi-cellular organism (CAD)
  - model and explain ways in which organelles work together to meet the cell’s needs (CAD)
  - relate the structure of cells, tissues, organs, and systems to their functions in supporting life (CAD)
  - explain the structure and function of organelles in eukaryotic cells
  - examine cells microscopically
  - demonstrate correct microscopic techniques
  - compare and contrast plant and animal cells
  - differentiate among the different organelles and their functions in different types of cells
  - analyze the composition of organisms
  - make observations and detail in journal changes to the Wisconsin fast plants as they germinate and develop (differentiate into tissues and organ systems)
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| **Skills and Topics:** | ● make observations on an example of an organism which undergoes complete metamorphosis  
● detail changes in a notebook with explanations justifying the changes as an example of development  
● relate the structures of cells, tissues, organs, and systems to their functions in supporting life (CAD)  
● model the effect of positive and negative changes in population size on a symbiotic pairing | ● discuss how the carrying capacity of an ecosystem depends on biotic and abiotic factors  
● predict the impact that altering biotic and abiotic factors have on an ecosystem (CAD)  
● create a model of ecosystems in two different locations and compare and contrast the living and nonliving components (CAD)  
● describe ways that humans can improve the health of ecosystems around the world (CAD)  
● investigate ecological succession  
Note: during the month of November, journaling and predictions of the moon’s position are infused due to the relationship in the fall sky | ● compare cellular structure and function in plants with those in animal cells  
● compare eukaryotic and prokaryotic cells  
● characterize viruses as the boundary between living and nonliving things |

**Integration of Technology:**


**Writing:**

Open-ended responses, conclusions and analysis of exploratory activities, student journals

**Laboratories:**

Exploring biotic and abiotic factors  
Tree observation  
Cultivation of impatiens plants  
Investigating the nitrogen cycle in a closed system  
Pizza microscope drawing  
Impatiens cultivation  
Tree change observations  
Owl pellets  
Plant versus animal cell laboratory  
Examining cell structure  
Elephant-sized amoebas  
Molecular modeling  
Wisconsin fast plants

**Formative Assessments:**

Laboratories:

- Exploring biotic and abiotic factors
- Tree observation
- Cultivation of impatiens plants

Laboratories:

- Investigating the nitrogen cycle in a closed system
- Pizza microscope drawing
- Impatiens cultivation
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- Examining cell structure
- Elephant-sized amoebas
- Molecular modeling
- Wisconsin fast plants

**Laboratory experiments and reports include, but are not limited to, the above list**
| **Formative Assessments:** | Warm-up activities  
Exploratory activities  
Class discussions  
Student participation  
Teacher observations | Field trip to Fairview Environmental Education Center exploring:  
- Dominant eye in archery  
- Eutrophication of the lake  
- Stream studies  
- Cidering techniques (fermentation)-sexual and asexual reproduction in trees  
- Ridge hike-geology, life cycles, and sound | Warm-up activities  
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Health/PE:  
Technology: 8.1.8.A.1-5, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1-3, 8.1.8.E.1, 8.1.8.F.1, 8.2.8.B.3, 8.2.8.D.1, 8.2.8.F.1-2  
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| 21st Century Themes: | ☑ Global Awareness  ☐ Civic Literacy  
| Financial, Economic, Business, and Entrepreneurial Literacy  ☑ Health Literacy |
| 21st Century Skills: | ☑ Creativity and Innovation  ☑ Media Literacy  
| ☑ Critical Thinking and Problem Solving  ☑ Life and Career Skills  
| ☑ Information and Communication Technologies Literacy  ☑ Communication and Collaboration  
| ☑ Information Literacy |
| Suggested illustrative texts: “Space Probe”, *Astronomy & Space: From the Big Bang to the Big Crunch.* |
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<td>Essential Question:</td>
<td>How do cells perform functions for the organism?</td>
<td>How are species continued through time?</td>
<td>How are traits handed down?</td>
<td>How do living things change in response to a changing environment?</td>
<td>How can the addition of scientific data increase our understanding of an interdisciplinary topic?</td>
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<tr>
<td>Content:</td>
<td>Cell Processes: Energy Conversion and Transport</td>
<td>Cell Processes: Cell Division and Inheritance</td>
<td>Inheritance Patterns</td>
<td>Evolution</td>
<td>Interdisciplinary Project</td>
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<td>Skills and Topics:</td>
<td>● review physical changes and compare to chemical reactions  ● discuss conservation of matter  ● explain the relationship between producers and consumers  ● identify the source of all energy contained in ecosystems as the radiant energy from the sun  ● describe the sources of the reactants of photosynthesis and trace the pathway to the products (CAD)*  ● model the molecular building of sugars  ● discuss the structure and function of membranes</td>
<td>● investigate factors that limit cell size  ● identify reproduction as essential to the continuation of every species  ● recognize the cell cycle and the stages of mitosis  ● distinguish between sexual and asexual reproduction  ● defend the principle that, through reproduction, genetic traits are passed from one generation to the next using evidence collected from observations of inherited traits (CAD)</td>
<td>● distinguish between inherited and acquired traits/characteristics (CAD)  ● explain the source of variation among siblings (CAD)  ● describe and analyze Mendelian inheritance of traits using Punnett squares  ● compare and contrast patterns of inheritance through sex-linkage and incomplete dominance  ● explore probabilities and predict expected phenotypic and genotypic ratios  ● analyze a pedigree tracing predecessors’ genotypes</td>
<td>● delineate the evolutionary timeline of the creation of our universe  ● discover the environmental effects that cause change over time  ● cite examples of variation within organisms  ● explain variation within a population as the mechanism of natural selection  ● explore probabilities and predict expected phenotypic and genotypic ratios  ● analyze a pedigree tracing predecessors’ genotypes  ● model the molecular building of sugars  ● discuss the structure and function of membranes</td>
<td>● organize and present evidence to show how the extinction of a species is related to an inability to adapt to changing environmental conditions using quantitative and qualitative data (CAD)  ● compare the anatomical structures of a living species with fossil records to derive a line of descent (CAD)</td>
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<td><strong>Skills and Topics:</strong></td>
<td>● demonstrate the processes of diffusion and osmosis</td>
<td>● predict long-term effects of interference with normal patterns of reproduction (CAD)</td>
<td>● explain how knowledge of inherited variations within and between generations is applied to farming and animal breeding (CAD)</td>
<td>● describe the impact on the survival of species during specific times in geologic history when environmental conditions changed (CAD)</td>
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<td>● compare passive transport with the movement of organic and inorganic substances using cellular energy</td>
<td>● compare the stability of genetic information from one parent with the variation resulting from recombination of genetic material from two parents</td>
<td>● describe the environmental conditions or factors that may lead to a change in a cell’s genetic information or to an organism’s development and how these changes are passed on (CAD)</td>
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<td>● summarize the steps of cellular respiration</td>
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**Integration of Technology:**

**Writing:**
- Open-ended responses, conclusions and analysis of exploratory activities, student journals

**Formative Assessments:**
- Laboratories:
  - What are plants made of?
  - Elephant-size amoebas
  - Clothing combos
  - Bug Builders

- Laboratories:
  - Build an animal
  - Population growth versus food supply
  - Survival of the chocolates

- Field trip to Fairview Environmental Education Center

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