**MARYLAND ENVIRONMENTAL LITERACY STANDARDS & NGSS**

# Elementary Matrix-K

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| Standards and Indicators | NGSS Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| **STANDARD 1. Environmental Issues** **The student will investigate and analyze environmental issues ranging from local to global perspectives and develop and implement a local action project that protects, sustains, or enhances the natural environment.**  |
| **Topic A: Environmental Issue Investigation** |
| 1. Identify an environmental issue.
 | Obtaining, evaluating and communicating information | ETS1.A: Defining and Delimiting an Engineering Problem ♣ Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary to K-ESS3-2) | SystemsStability and Change |
| 1. Develop and write research questions related to an environmental issue.
 | Planning and carrying out investigations | ETS1.B: Developing Possible Solutions ♣ Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. (secondary to K-ESS3-3) |  |
| 1. Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders’ beliefs and values.
 | Obtaining, evaluating and communicating information |  |  |
| 1. Design and conduct the research.
 | Planning and carrying out investigations |  |  |
| 1. Use data and references to interpret findings to form conclusions.
 | Analyzing and interpreting data |  |  |
| **Topic B: Action Component** |
| 1. Use recommendation(s) to develop and implement an environmental action plan.
 | Constructing explanations and designing solutions |  |  |
| 1. Communicate, evaluate and justify personal views on environmental issue and alternate ways to address them.
 | Obtaining, evaluating and communicating information |  |  |
| 1. Analyze the effectiveness of the action plan in terms of achieving the desired outcomes.
 | Analyzing and interpreting data |  |  |

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| **STANDARD 2. INTERACTIONS OF EARTH’S SYSTEMS****The student will analyze and apply the properties of systems thinking and modeling to the study of Earth’s systems.** |
| **Topic A: Earth Systems** |
| 1. The student will analyze and explain the interactions of earth’s systems.
 | Obtaining, evaluating and communicating informationConstructing explanations and designing solutions |  | Systems and system models |
| **Topic B: Systems Thinking** |
| 1. Analyze, explain and apply the properties of systems thinking to earth systems interactions.
 | Constructing explanations and designing solutions |  | Systems and system models |
| 1. Use models and computer simulations to extend his/her understanding of scientific concepts.
 | Developing and using models |  | Systems and system models |

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| **STANDARD 3****FLOW OF MATTER & ENERGY****The student will analyze and explain the movement of matter and energy through interactions of earth’s systems (*biosphere, geosphere, hydrosphere, atmosphere, and cryosphere*) and the influence of this movement on weather patterns, climatic zones, and the distribution of life.**  |
| **Topic A:** **Conservation of Matter within Earth Systems** |
| 1. Demonstrate that matter cycles through and between living systems and the physical environment, constantly being recombined in different ways
 | Analyzing and interpreting dataConstructing explanations and designing solutions |  | Systems and system modelsEnergy & Matter: Mechanisms and Explanation |
| **Topic B: Energy Distribution through Earth Systems** |
| 1. Analyze how the position and movement of the Earth in space determine distribution of heat and light.
 | Analyzing and interpreting dataConstructing explanations and designing solutions | PS3.B: Conservation of Energy and Energy Transfer ♣ Sunlight warms Earth’s surface. (K-PS3-1),(K-PS3-2) | Cause and effect: Mechanisms and Explanation |
| 1. Explain that transfer of thermal energy between the atmosphere and the land or oceans produces temperature and density gradients in the atmosphere and the oceans.
 | Constructing explanations and designing solutions |  | Cause and effect: Mechanisms and Explanation |
| 1. Explain that transfer of thermal energy between the atmosphere and the land or oceans influences climate patterns.
 | Constructing explanations and designing solutions | ESS2.D: Weather and Climate ♣ Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)ESS3.B: Natural Hazards ♣ Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2) | Cause and effect: Mechanisms and Explanation |
| **Topic C: Interaction of Physical Systems and the Biosphere** |
| 1. Analyze and explain the movement of matter and energy through earth’s systems and the influence of this movement on the distribution of life.
 | Analyzing and interpreting dataConstructing explanations and designing solutions |  | Systems and system modelsEnergy & Matter: Mechanisms and Explanation |

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| **STANDARD 4** **POPULATIONS, COMMUNITIES AND ECOSYSTEMS****The student will use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of humans and organisms in populations, communities and ecosystems**. |
| **Topic A: Cycling of Matter and Energy** |
| 1. Explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level.
 | Constructing explanations and designing solutions | LS1.C: Organization for Matter and Energy Flow in Organisms ♣ All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) | Systems and system modelsEnergy & Matter: Mechanisms and Explanation |
| **Topic B: Population Dynamics** |
| 1. Analyze the growth or decline of populations and identify a variety of responsible factors.
 | Analyzing and interpreting data |  | Cause and effect |
| **Topic C: Community and Ecosystem Dynamics** |
| 1. Explain how the interrelationships and interdependencies of organisms and populations contribute to the dynamics of communities and ecosystems.
 | Constructing explanations and designing solutions |  | Systems and system models |
| **Topic D: Stability in Populations, Communities and Ecosystems** |
| 1. Use models and provide examples to show how the interaction and interdependence of populations contribute to the stability of populations, communities and ecosystems.
 | Developing and using models |  | Systems and system modelsScale, proportion and quantity |
| 1. Use models and provide examples to show how species’ interactions may generate ecosystems that are stable for hundreds or thousands of years.
 | Developing and using models |  | Systems and system modelsScale, proportion and quantity |
| **Topic E: Diversity** |
| 1. Provide examples and evidence to show that a greater diversity of genes, species and/or environments increases the chance that at least some living things will survive in the face of large changes in the environment.
 | Constructing explanations and designing solutions |  | Scale, proportion and quantity |

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| **Standard 5** **Humans and Natural Resources****The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth’s natural systems and resources.** |
| **Topic A: Human Impact on Natural Processes** |
| Analyze the effects of human activities on earth’s natural processes. | Analyzing and interpreting data | ESS3.C: Human Impacts on Earth Systems ♣ Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary to K-ESS2-2) | Cause and effectStability and change |
| Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes. | Analyzing and interpreting data |  | Cause and effectStability and change |
| **Topic B: Human Impact on Natural Resources** |
| Analyze, from local to global levels, the relationship between human activities and the earth’s resources. | Analyzing and interpreting data | ESS3.A: Natural Resources ♣ Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1) | PatternsScale, proportion and quantityEnergy and matter: flows, cycles and conservation |

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| **Standard 6** **Environment and Health** **The student will use concepts from science, social studies and health to analyze and interpret both positive and negative impacts of natural events and human activities on human health.** |
| **Topic A: Natural Changes and Human Health** |
| Identify and describe natural changes in the environment that may affect the health of human populations and individuals. | Analyzing and interpreting data |  | Cause and effectStability and change |
| **Topic B: Human-Induced Changes and Human Health** |
| Describe and explain that many changes in the environment designed by humans bring benefits to society as well as cause risks. | Obtaining, evaluating and communicating information |  | Cause and effectStability and change |
| **Topic C: Hazards and Risk Analysis**  |
| Analyze and explain that human activities, products, processes, technologies and inventions can involve some level of risk to human health. | Obtaining, evaluating and communicating information |  | Cause and effectStability and change |

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| **Standard 7** **Environment & Society****The student will analyze how the interactions of heredity, experience, learning and culture influence social decisions and social change.** |
| **Topic A: Environmental Quality** |
| Investigate factors that influence environmental quality. | Analyzing and interpreting data |  | Cause and effect: Mechanisms and explanation |
| **Topic B:** **Individual and Group Actions and the Environment** |
| Examine the influence of individual and group actions on the environment and explain how groups and individuals can work to promote and balance interests. | Obtaining, evaluating and communicating information |  | Cause and effect: Mechanisms and explanation |
| **Topic C: Cultural Perspectives and the Environment** |
| Investigate cultural perspectives and dynamics and apply their understanding in context. | Obtaining, evaluating and communicating information |  | Scale, proportion and quantity |
| **Topic D: Political Systems and the Environment** |
| Understand how different political systems account for, manage, and affect natural resources and environmental quality. | Analyzing and interpreting dataObtaining, evaluating and communicating information |  | Systems and system models |
| **Topic E: Economics and Environment** |
| Analyze and explain global economic and environmental connections. | Obtaining, evaluating and communicating information |  | Systems and system models |
| **Topic F:Technology and Environment** |
| Investigate and examine the social and environmental impacts of various technologies and technological systems on the environment. | Analyzing and interpreting data |  | Cause and effect: Mechanisms and explanation |
| Investigate a decision involving the implementation of a new technology and present an assessment of risks, costs and benefits, identification of those who suffer, those who pay, those who gain, what the risks are, and who bears them. | Obtaining, evaluating and communicating information |  | Cause and effect: Mechanisms and explanation |

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| **standard 8****SUSTAINABILITY****The student will make decisions that demonstrate understanding of natural communities and the ecological, economic, political, and social systems of human communities, and examine how their personal and collective actions affect the sustainability of these interrelated systems.** |
| **Topic A: Intergenerational Responsibility** |
| Understand and apply the basic concept of sustainability to natural and human communities. | Obtaining, evaluating and communicating information |  | Stability and change |
| **Topic B: Interconnectedness of Systems**  |
| Recognize the concept of sustainability as a dynamic condition characterized by the interdependency among ecological, economic, and social systems and how these interconnected systems affect individual and societal well-being. | Obtaining, evaluating and communicating information |  | Cause and effect: mechanisms and explanation Systems and system modelsStability and change |
| **Topic C: Influence of Economic Systems on Sustainability** |
| Investigate and make decisions that demonstrate understanding of how the dynamics of economic systems affect the sustainability of ecological and social systems. | Obtaining, evaluating and communicating information |  | Systems and system modelsStability and change |
| **Topic D: Influence of Social and Cultural Systems on Sustainability** |
| Investigate and make decisions that demonstrate understanding of how the dynamics of social and cultural systems affect the sustainability of ecological and economic systems. | Obtaining, evaluating and communicating informationEngaging in argument from evidence |  | Systems and system modelsStability and changeStructure and function |
| **Topic E: Limits of Ecological Systems** |
| Investigate and make decisions that demonstrate understanding of how the dynamics of ecological systems affect the sustainability of social, cultural, and economic systems. | Obtaining, evaluating and communicating informationEngaging in argument from evidence Constructing explanations and designing solutions |  | Systems and system modelsStability and changeStructure and function |
| **Topic F: Action Component**  |
| Apply knowledge and skills to investigate and implement personal and collective decisions and actions on an individual, local community, national, and global levels in order to achieve sustainability. | Planning and carrying out investigations Constructing explanations and designing solutions |  | Systems and system modelsStability and changeStructure and function |