

### Middle School Phenomenon Model - Course II Summary

*Storyline/Narrative:* This course model arranges the Performance Expectations (PEs) outlined in the second year of the middle school conceptual progressions model from Appendix K of the Next Generation Science Standards into five different bundles of PEs using a phenomenon-based arrangement. The bundles in this model follow a conceptual flow throughout the year.

The first bundle focuses on the transfer of energy and matter between Earth’s systems. The second bundle applies this understanding of energy and matter transfer to a study of climate diversity on the Earth. The third bundle focuses on gravity and Earth’s place in the solar system, the fourth on cells and body systems, and the fifth on growth and reproduction. Each bundle is organized around the DCIs that would help students explain a unifying phenomenon and answer a guiding question. It is important to note that the practices and crosscutting concepts described are intended as end-of-instructional unit expectations and not curricular designations. Additional practices and crosscutting concepts should be used throughout instruction toward each bundle.

<b>Bundle 1:</b> Why do people live and farm on volcanoes? ~ 6 weeks	<b>Bundle 2:</b> What causes climates to be so different across the Earth? ~ 6 weeks	<b>Bundle 3:</b> Why can we predict solar eclipses? ~ 4 weeks	<b>Bundle 4:</b> Why are bones so hard? ~ 4 weeks	<b>Bundle 5:</b> Why do some parents and offspring look different? ~ 6 weeks
<p><b>MS-LS1-6.</b> Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and the flow of energy into and out of organisms.</p> <p><b>MS-LS1-7.</b> 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.</p> <p><b>MS-LS2-3.</b> Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem.</p> <p><b>MS-ESS2-1.</b> Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.</p> <p><b>MS-ESS2-2.</b> Construct an explanation based on evidence for how geosciences processes have changed Earth’s surface at varying time and spatial scales.</p>	<p><b>MS-PS4-3.</b> Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.</p> <p><b>MS-ESS2-5.</b> Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.</p> <p><b>MS-ESS2-6.</b> Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.</p> <p><b>MS-ESS3-2.</b> Analyze and interpret data on natural hazards to forecast catastrophic events and inform the development of technologies to mitigate their effects.</p> <p><b>MS-ETS1-1.</b> Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts.</p>	<p><b>MS-PS3-2.</b> Develop and use a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.</p> <p><b>MS-ESS1-1.</b> Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.</p> <p><b>MS-ESS1-2.</b> Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.</p>	<p><b>MS-LS1-1.</b> Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.</p> <p><b>MS-LS1-2.</b> Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.</p> <p><b>MS-LS1-3.</b> Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.</p>	<p><b>MS-LS1-4.</b> Use argument 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.</p> <p><b>MS-LS1-5.</b> Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</p> <p><b>MS-LS3-1.</b> 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.</p> <p><b>MS-LS3-2.</b> Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and</p>

NGSS Example Bundles

<p><b>Bundle 1:</b> Why do people live and farm on volcanoes? ~ 6 weeks</p>	<p><b>Bundle 2:</b> What causes climates to be so different across the Earth? ~ 6 weeks</p>	<p><b>Bundle 3:</b> Why can we predict solar eclipses? ~ 4 weeks</p>	<p><b>Bundle 4:</b> Why are bones so hard? ~ 4 weeks</p>	<p><b>Bundle 5:</b> Why do some parents and offspring look different? ~ 6 weeks</p>
	<p>on people and the natural environment that may limit possible solutions. <b>MS-ETS1-2:</b> Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p>			<p>sexual reproduction results in offspring with genetic variation.</p>

Middle School Phenomenon Model Course 2 Flowchart

