

## 4th Grade Thematic Model

*Narrative and Rationale:* The three bundles in this Grade 4 model are characterized by the overarching theme that students can find evidence of patterns and systems throughout the natural and designed world. Each bundle also relates to energy transfer, as students begin to learn about the concept of energy moving and colliding objects and the role of energy in a large system early in the year, and then apply that knowledge to information transfer and to different Earth systems later in the year.

Cognitive demand increases as the year progresses, with the expectations that students will become more adept at using the science and engineering practices and the crosscutting concepts. The instruction begins with concrete, familiar experiences and moves to more abstract learning. 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 in each bundle.

Bundle 1: What evidence of patterns and systems do we see in motion, weathering, fossils, and rock formation? ~12 weeks	Bundle 2: What evidence of patterns and systems do we see in organism structure and how those structures function in information transfer? ~12 weeks	Bundle 3: What evidence of patterns and systems do we see in erosion, waves, and Earth features? ~12 weeks
<ul> <li>4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.</li> <li>4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.</li> <li>4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers for changes in a landscape over time to support an explanation for changes in a landscape over time.</li> <li>4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.<sup>1</sup></li> <li>3-5 ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.<sup>1</sup></li> </ul>	<ul> <li>4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</li> <li>4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye.</li> <li>4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.*</li> <li>4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.</li> <li>4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.</li> <li>3-5 ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</li> </ul>	<ul> <li>4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*</li> <li>4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.</li> <li>4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.</li> <li>4 ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.</li> <li>4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.</li> <li>4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*</li> </ul>

<sup>1</sup> The bundle only includes part of this PE; the PE is not fully assessable in a unit of instruction leading to this bundle.

Bundle 1	Bundle 2	В
<ul> <li>PS3.A as found in 4-PS3-1</li> <li>The faster a given object is moving, the more energy it possesses.</li> </ul>	<ul> <li>PS3.A as found in 4-PS3-2</li> <li>Energy can be moved from place to place by moving objects or through sound, light, or electric currents.</li> </ul>	<ul> <li>PS3.B as found in 4-PS3-4</li> <li>Energy can also be transferre which can then be used local The currents may have been energy of motion into electric</li> </ul>
<ul> <li>PS3.A as found in 4-PS3-3</li> <li>Energy can be moved from place to place by moving objects or through sound, light, or electric currents.</li> </ul>	<ul> <li>PS3.B as found in 4-PS3-2</li> <li>Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy</li> </ul>	<ul> <li>PS3.D as found in 4-PS3-4</li> <li>The expression "produce energy into a desired"</li> </ul>
<ul> <li>PS3.B as found in 4-PS3-3</li> <li>Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.</li> </ul>	<ul> <li>is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.</li> <li>Light also transfers energy from place to place.</li> <li>Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.</li> </ul>	<ul> <li>PS4.A as found in 4-PS4-1</li> <li>Waves, which are regular pat disturbing the surface. When water, the water goes up and the direction of the wave exc</li> <li>Waves of the same type can wavelength (spacing between</li> </ul>
<ul> <li>PS3.C as found in 4-PS3-3</li> <li>When objects collide, the contact forces transfer energy so as to change the objects' motions.</li> </ul>	<ul> <li><b>PS4.B as found in 4-PS4-2</b></li> <li>An object can be seen when light reflected from its surface enters the eyes.</li> </ul>	<ul> <li>ESS2.A as found in 4-ESS2-1</li> <li>Rainfall helps to shape the lan found in a region. Water, ice, rocks, soils, and sediments in around.</li> </ul>
ESS3.B in Bundle 3	<ul><li>PS4.C as found in 4-PS4-3</li><li>Digitized information can be transmitted over long distances without</li></ul>	ESS2.E as found in 4-ESS2-1 • Living things affect the physic
<ul> <li>ESS1.C as found in 4-ESS1-1         <ul> <li>Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.</li></ul></li></ul>	significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.	<ul> <li>ESS2.B as found in 4-ESS2-2</li> <li>The locations of mountain ranstructures, earthquakes, and earthquakes and volcanoos a</li> </ul>
	<ul> <li>LS1.A as found in 4-LS1-1</li> <li>Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.</li> </ul>	boundaries between continent form inside continents or nea different land and water feat
	<ul> <li>LS1.D as found in 4-LS1-2</li> <li>Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals</li> </ul>	<ul> <li>ESS3.A as found in 4-ESS3-1</li> <li>Energy and fuels that humans their use affects the environm renewable over time, and oth</li> </ul>
<ul> <li>ESS2.E as found in 4-ESS2-1</li> <li>Living things affect the physical characteristics of their regions.</li> </ul>	are able to use their perceptions and memories to guide their actions.	<ul> <li>ESS3.B as found in 4-ESS3-2</li> <li>A variety of hazards result fro tsunamis, volcanic eruptions)</li> </ul>
<ul> <li>ETS1.B as found in 3-5-ETS1-2</li> <li>Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.</li> <li>At whatever stage, communicating with peers about proposed solutions is an important part of the design process. and shared ideas can lead to</li> </ul>	<ul> <li>Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.</li> <li>At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.</li> </ul>	<ul> <li>can take steps to reduce their</li> <li>ETS1.A as found in 4-PS3-4</li> <li>Possible solutions to a proble resources (constraints). The s by considering the desired fe proposals for solutions can be one meets the specified crite</li> </ul>
improved designs.	<ul><li>ETS1.C as found in 4-PS4-3</li><li>Different solutions need to be tested in order to determine which of</li></ul>	constraints into account. ETS1.B as found in 4-ESS3-2

# them best solves the problem, given the criteria and the constraints.

# Bundle 3

### 4-PS3-4

e transferred from place to place by electric currents, e used locally to produce motion, sound, heat, or light. have been produced to begin with by transforming the into electrical energy.

#### 4-PS3-4

produce energy" typically refers to the conversion of to a desired form for practical use.

#### 4-PS4-1

regular patterns of motion, can be made in water by rface. When waves move across the surface of deep goes up and down in place; there is no net motion in he wave except when the water meets a beach. ne type can differ in amplitude (height of the wave) and ing between wave peaks).

#### 4-ESS2-1

shape the land and affects the types of living things . Water, ice, wind, living organisms, and gravity break ediments into smaller particles and move them

#### 14-ESS2-1

ct the physical characteristics of their regions.

#### 4-ESS2-2

mountain ranges, deep ocean trenches, ocean floor quakes, and volcanoes occur in patterns. Most volcanoes occur in bands that are often along the een continents and oceans. Major mountain chains nents or near their edges. Maps can help locate the d water features areas of Earth.

#### 4-ESS3-1

that humans use are derived from natural sources, and the environment in multiple ways. Some resources are ime, and others are not.

#### 4-ESS3-2

rds result from natural processes (e.g., earthquakes, c eruptions). Humans cannot eliminate the hazards but reduce their impacts.

#### 1 4-PS3-4

to a problem are limited by available materials and aints). The success of a designed solution is determined e desired features of a solution (criteria). Different utions can be compared on the basis of how well each ecified criteria for success or how well each takes the iccount.

• Testing a solution involves investigating how well it performs under a range of likely conditions.